International Collaboration on V-HUB - New Standard for Vehicular Information Systems in Disasters and the Philippine Use Case for Smart Beacons, UAVs, DTN, and Mobile Clouds

Professor Gregory Tangonan and Professor Nathaniel Libatique
Ateneo Innovation Center
Ateneo de Manila University

"Bridging the research on antenna, propagation and wireless technologies between the Philippines and Japan"

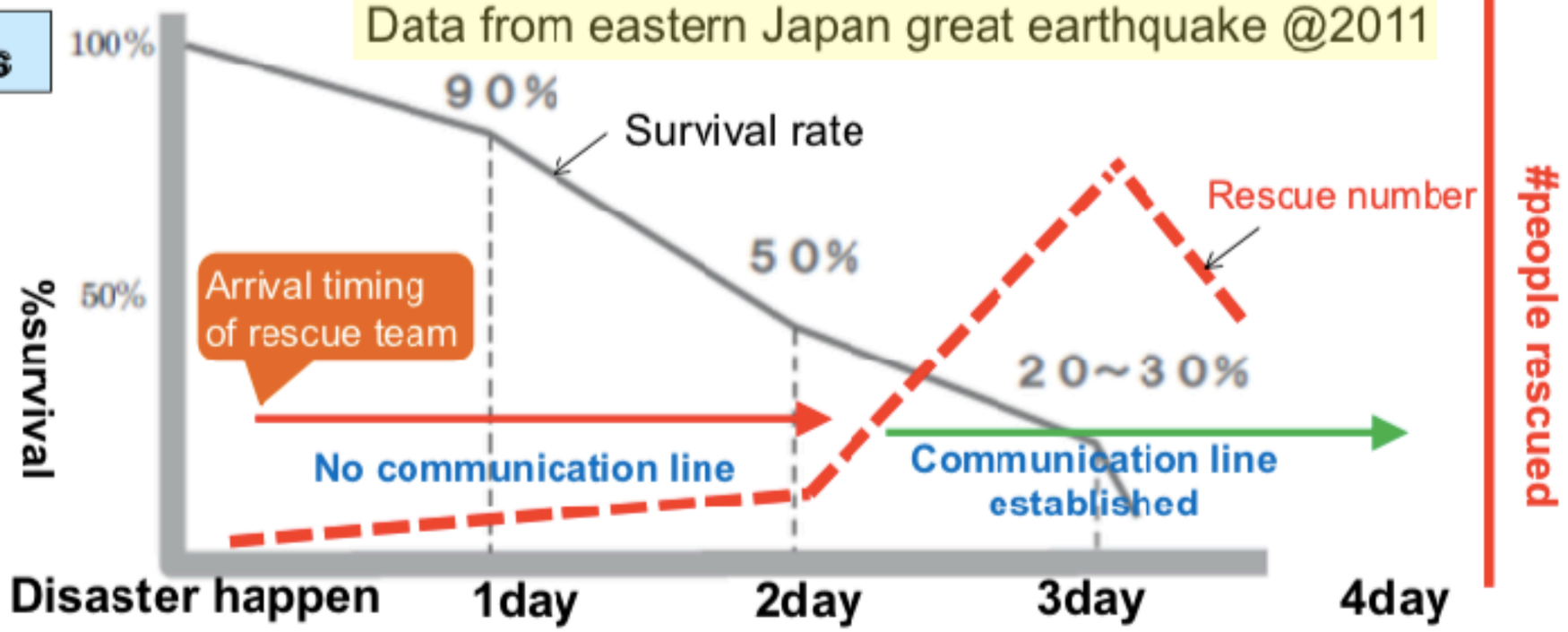
December 4-5, 2019
Quezon City, Philippines

Philippines-Japan Workshop on Wireless, Radio and Antenna Technologies (PJWWRAT)

Lesson from past disaster

TOYOTA InfoTechnology Center Co., Ltd.

Problems



Proposals from the lesson

(1) To save the life
Victim rescue support — VHUB

(2) To connect with important person
Safety confirmation — Cellular + VHUB

(3) Living support — Cellular + wired-network

Cellular + Wireless

VHUB is used as EVERYDAY Network V-X
Intelligent Transport 700 MHz - ARIB STD-T109

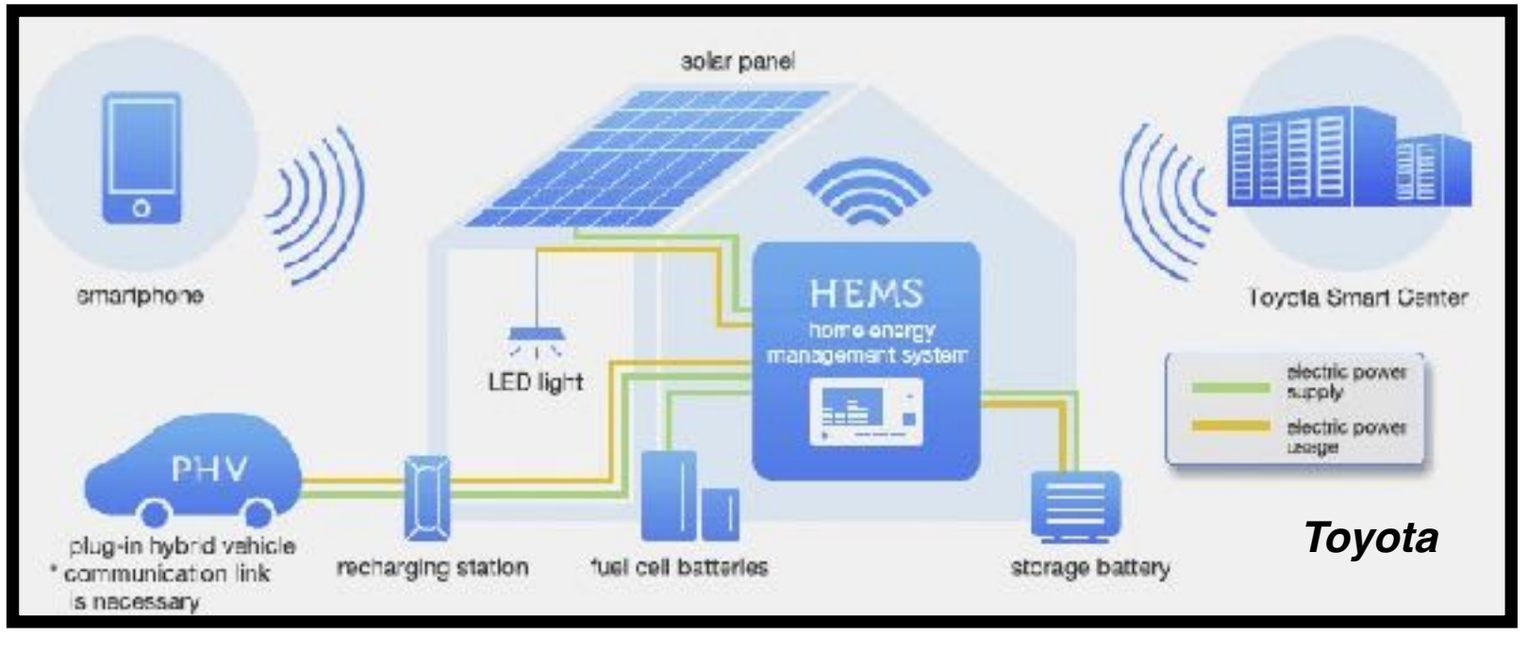
http://docplayer.net/149866098-The-disaster-victim-rescue-support-system-using-v2x-technology-for-safe-driving-support-and-vehicle-hub-standardization-in-apt.html

After: Y. Chimura, Y. Doi, and CY Luo : https://www.ituaj.jp › nb31-3_web-6_Special-ConnectedCars NaturalDisaster

Philippines-Japan Workshop on Wireless ,Radio and Antenna Technologies (PJWWRAT)

Hybrid Vehicles Provide Power to Homes in Disasters

Vehicle with 30 liters fuel can with inverter package generate 1.5 kW for two days. Prius battery - 4kWh

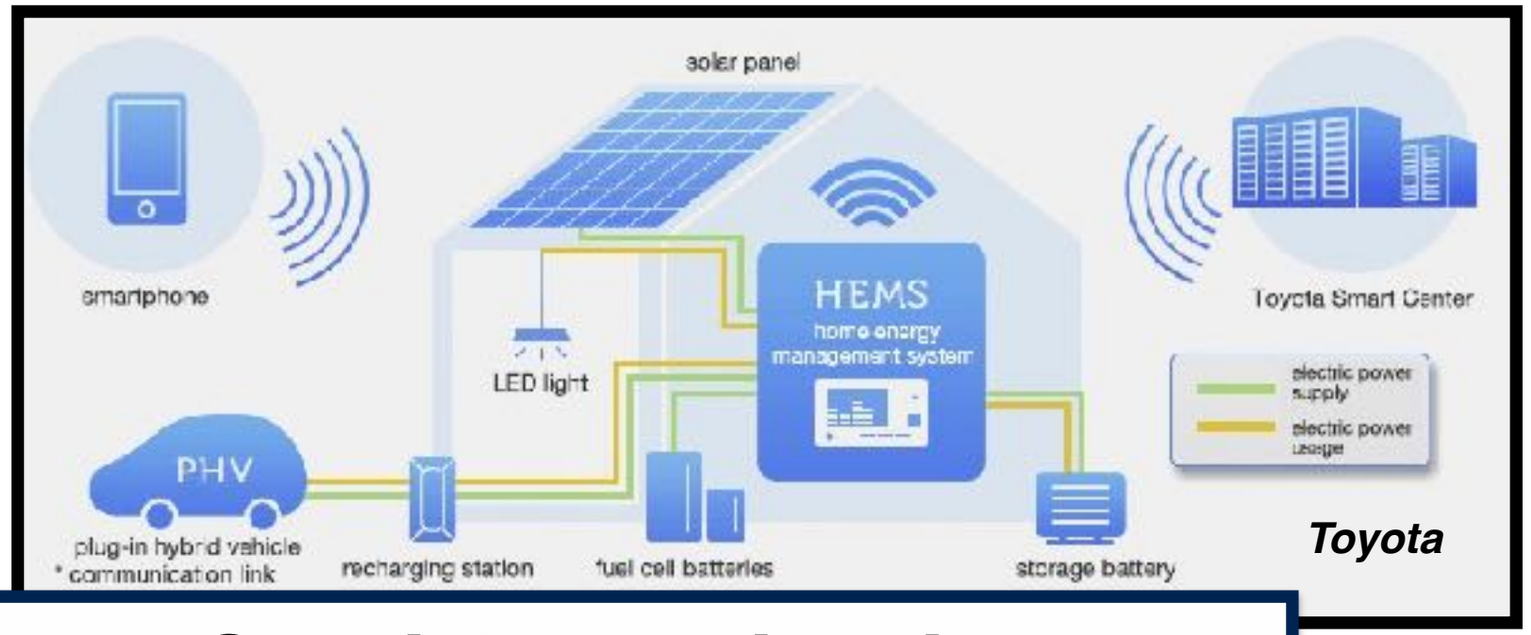


In a Disaster Vehicles provide Vital Electrical Power

Lights, Clean Water, Comm Hub, and Tools

Hybrid Vehicles Provide Power to Homes in Disasters

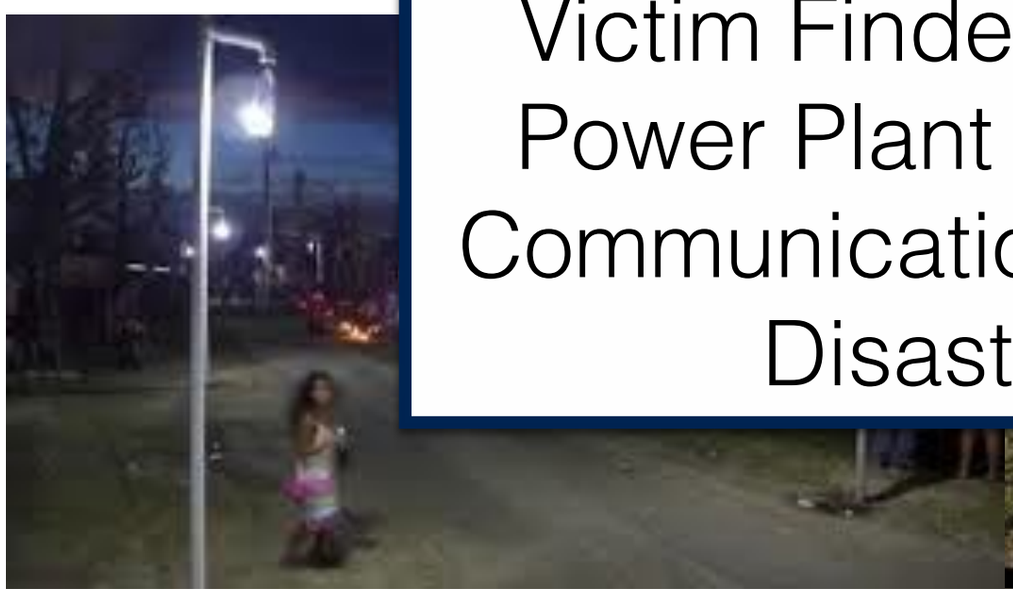
Vehicle with 30 liters fuel can with inverter package generate 1.5 kW for two days. Prius battery - 4kWh

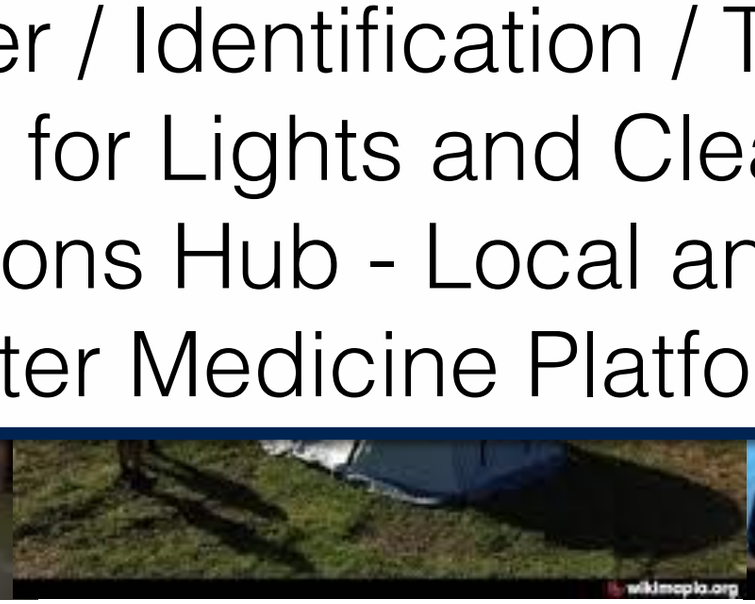


Vehicles Play a Crucial Role in Disasters

Evacuation Phase
Debris Clearing / Survivor Transport
Victim Finder / Identification / Transport
Power Plant for Lights and Clean Water
Communications Hub - Local and Remote
Disaster Medicine Platform

In a D **wer**

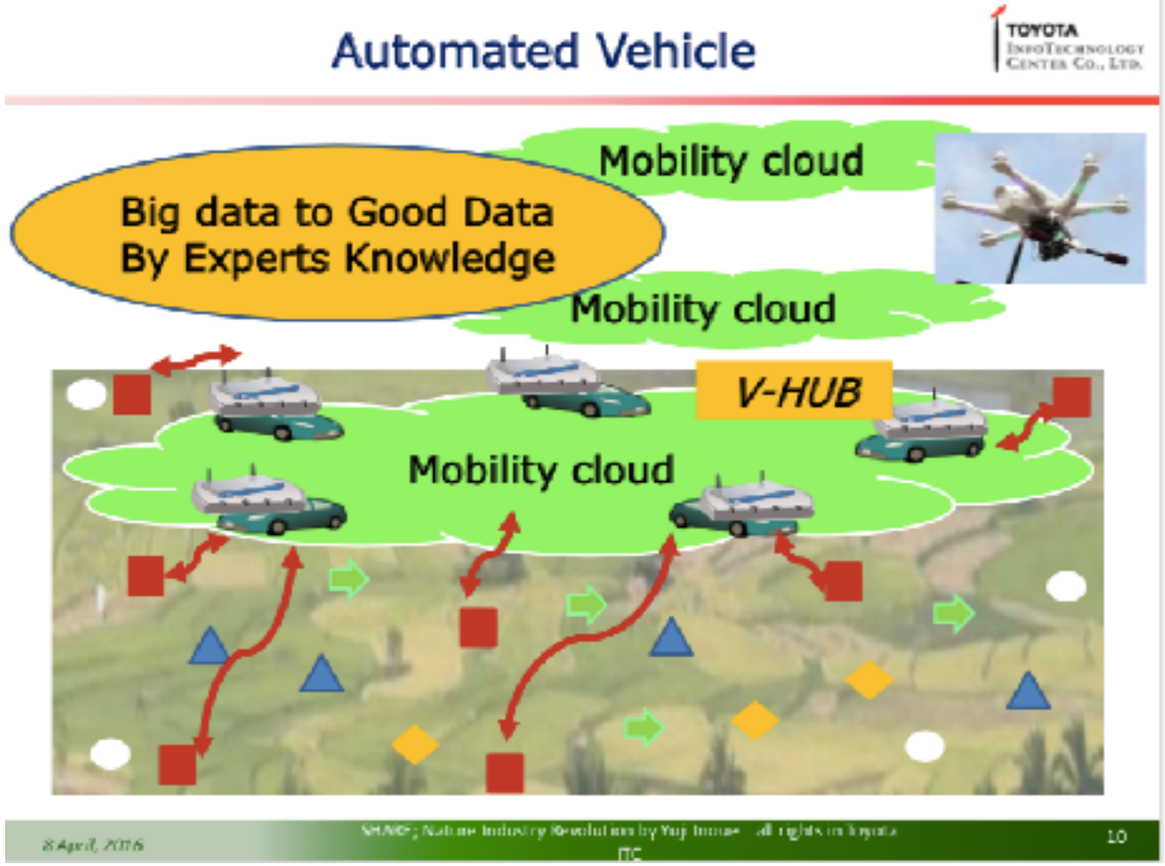


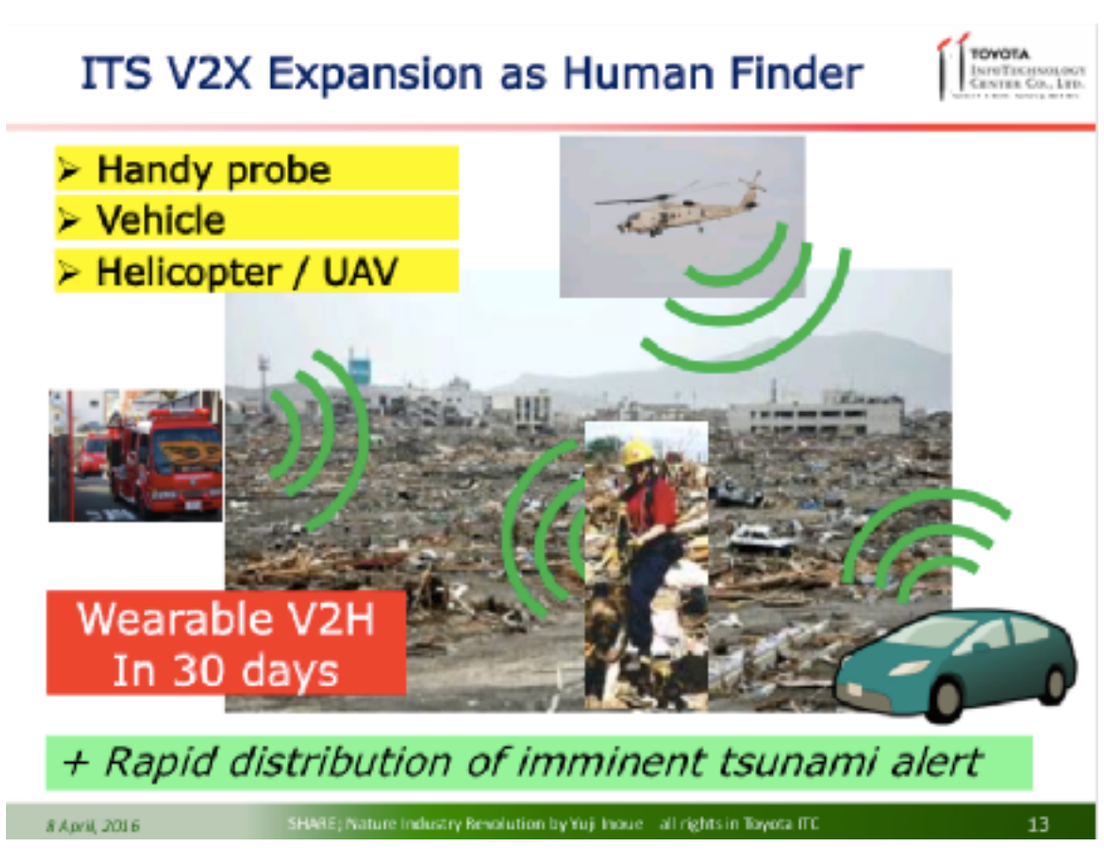


Origins of the V-HUB Concept

SHARE Project Collaboration with Dr. Yuji Inoue of Toyota InfoTech Center and GLT of Ateneo

Design Goals:
UAVs, V2X, Persons Sharing One Network
New Spectral Bands used for V2X (Sub-GHz)
Transition from Everyday —> Emergencies
Critical - Reunite Families, ID Recovery
Quick Emergence of New Gear for V-Hub (ARIB)





We gratefully acknowledge the great guidance and support of the APT for its 'Bridging the Standards Gap' Initiative, that led to the V-Hub Standard Approval.

ASIA-PACIFIC TELECOMMUNITY
The 25th APT Standardization Program Forum (ASTAP-25)
02 – 06 March 2015, Bangkok, Thailand

Document ASTAP-25/INP-30
23 February 2015

The Telecommunication Technology Committee (TTC), Japan

PROPOSAL OF STANDARD FRAMEWORK FOR DISASTER INFORMATION AND COMMUNICATION SYSTEM USING VEHICLE AS COMMUNICATION HUB

Abstract

This contribution proposes the draft of "Standard Framework for Disaster Information and Communication System using Vehicle as Communication Hub".

Introduction

In WG-BSG of ASTAP-24, TTC proposed "Proposed new study item on utilization of vehicles as information hubs During Disasters (ASTAP-24/INP-19)". The meeting agreed to the following proposals;

Proposals agreed in ASTAP-24:

1. *A work item on Utilization of vehicles as information hubs during disasters should be initiated in BSG WG with a perspective on usage cases, technologies and regulations.*
2. *ASTAP should initiate on utilization of vehicles as information hubs during disasters including. roles of vehicles in disasters situation, study of possible frequency band to be used in the case, developing streamline standard for early responder.*

First APT Proposals - DICT/Ateneo and TTC/Toyota

Vehicles- Shelter, Power, Comm Hub

Asia Pacific Nations Will Experience

Massive Earthquakes
Devastating Tsunamis
Destructive Typhoons

Japan (2011)

Philippines (2013)

Critical Need for Decision Support Systems

- the whiteboards at every evacuation site

Thailand 2004

Japan 2011

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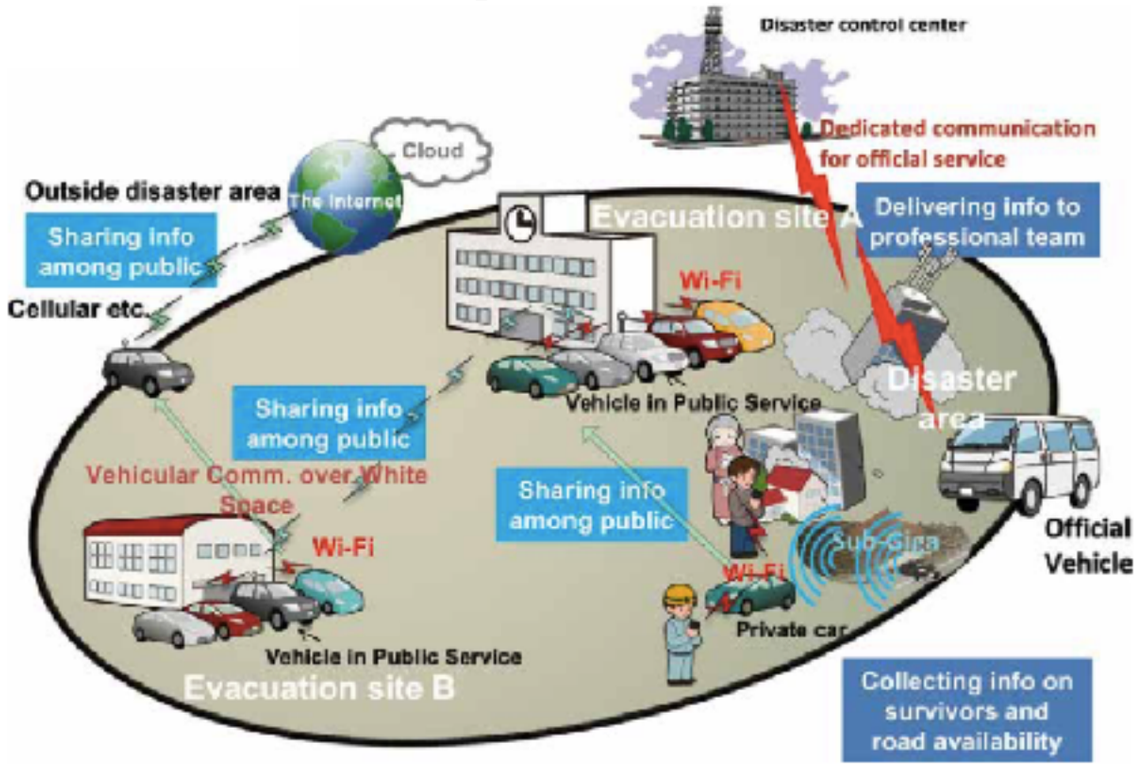
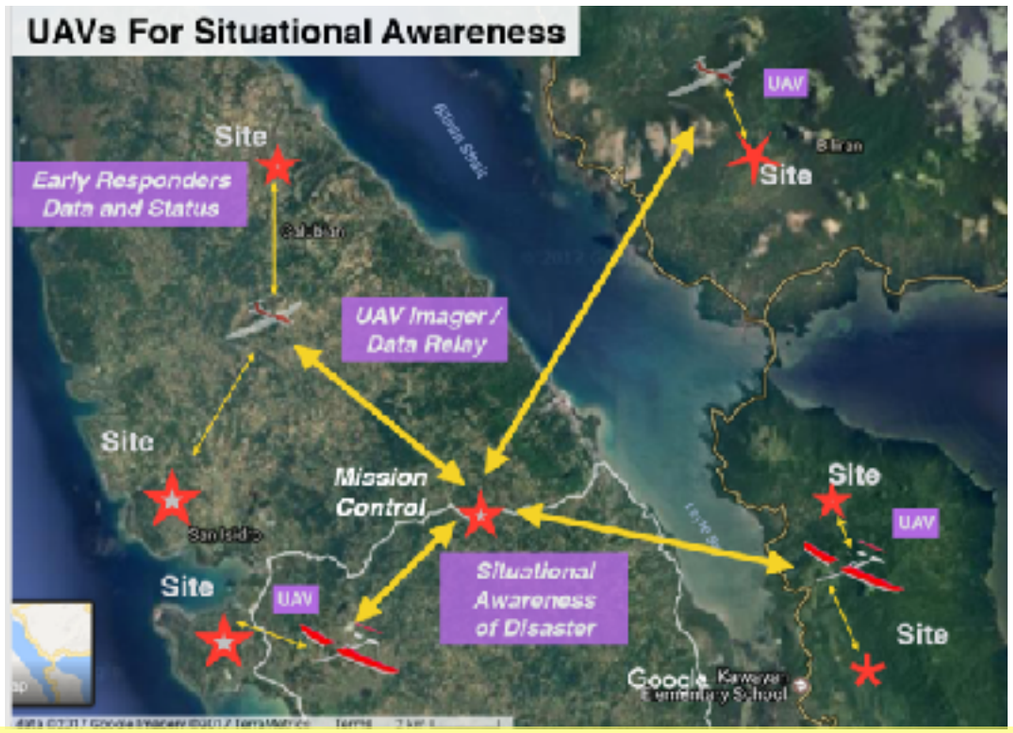
Japan - Philippines Cooperation in V-Hub Development

VHUB STANDARD

- Develop a set of utilization standards for vehicles as
  - Nodes in resilient communications networks
  - Information and power hubs in disasters
- Elicit contributions and experiences from Asian experts - Use Cases
- Develop a draft specification document for ASTAP and future standardization efforts



Industry: New V-X ARIB Devices, Sub-GHz Frequencies, V-V Protocol from ARIB Standard



Ateneo: Philippines Use Case and New Deployments - UAVs, V-X Hub, LoRa Beacons, Mobile Cloud

APT Participants Sharing V-HUB Use Cases

Philippines

- Ateneo Innovation Center (AIC) - Ateneo de Manila University
- Department of Information and Communications Technology (DICT)
    - National Telecommunications Commission (NTC)
- Philippine Communications Satellite Corporation (Philcomsat)

Japan

- Telecommunication Technology Committee (TTC)
- Toyota InfoTechnology Center Co., Ltd. (Toyota-ITC)
- Oki Electric Industry Co., Ltd.
- Honda Motor Co., Ltd.
- SKY Perfect JSAT Corporation

Malaysia

- Universiti Putra Malaysia

Thailand

- Internet Education and Research Laboratory (intERLab) - Asian Institute of Technology
- CAT Telecom Public Company Limited

Papua New Guinea

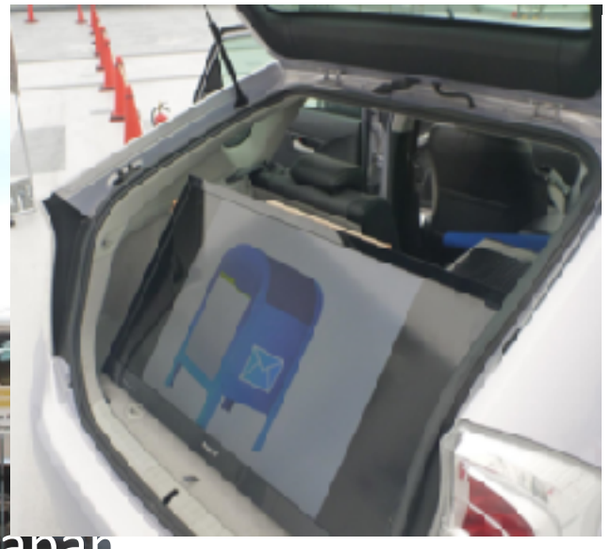
- National Information & Communication Technology Authority (NICTA)

January 6, 2017	Notification of selection of the project for the International Collaborative Research Program of the APT
January 25, 2017	Notification of Acceptance of the Philippines through DICT
March 8, 2017	Kick-off meeting of the Philippine-Japan team in Bangkok during ASTAP-28
April 2017	Writing of the initial Draft Specification v.0.1
May 2017	Circulation and review of the Draft Specification v0.1 to member countries
June 2017	Update Draft Specification to v.0.8. using initial comments
July 11-15, 2017	Conduct of the International Workshop in the Philippines; updating of Draft Specification to v.0.9. plus workshop talks and demonstrations
August 2017	Update Draft Specification to v.1.0 for presentation in ASTAP-29
September 2017	Present to ASTAP-29 and agree to Draft Specification v.1.0
November 2017	Meeting of the Steering Committee in Tokyo, Japan
December 2017	Editing of Final Report and Financial Report

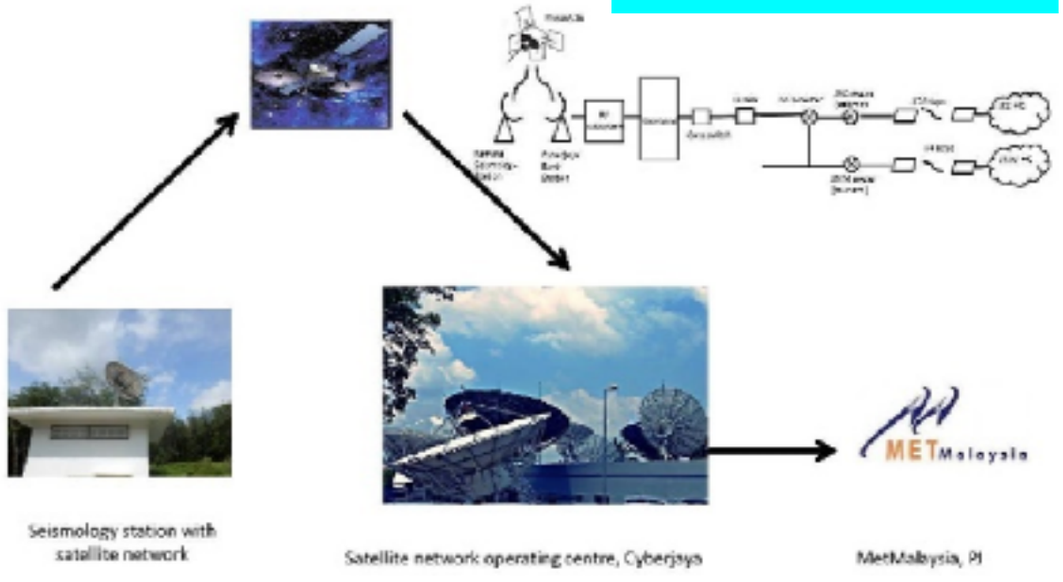
ASEAN + Japan Use Cases for V-HUB

Malaysia, Seismic Information Communications

Truck is emulating an evacuation center



Toyota Infotech, NICT, MIC, Japan



Seismology station with satellite network

Satellite network operating centre, Cyberjaya

MetMalaysia, PI

Honda Motor Inc, Japan

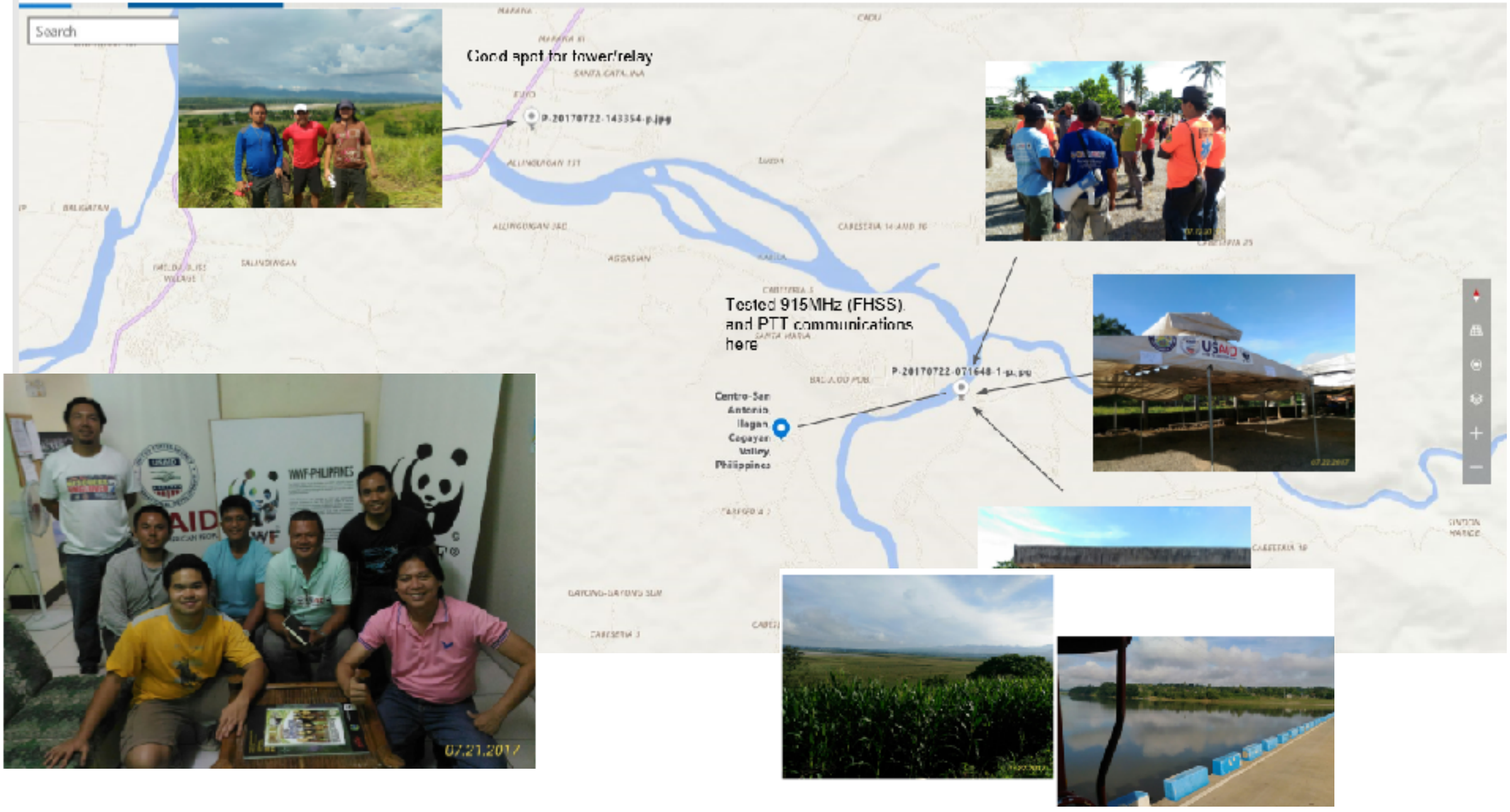
Interlab and AIT, Dumbonet System, Thailand

Sky Perfect, JSAT

Tohoku Earthquake

Use Case: Flood Drills in Ilagan Isabela, July 2017. Deployment of resilient communications and sustainable engagement with Community DRR Teams

USAID-FUNDED FLOOD DRILLS IN ILAGAN, ISABELA - JULY 22, 2017

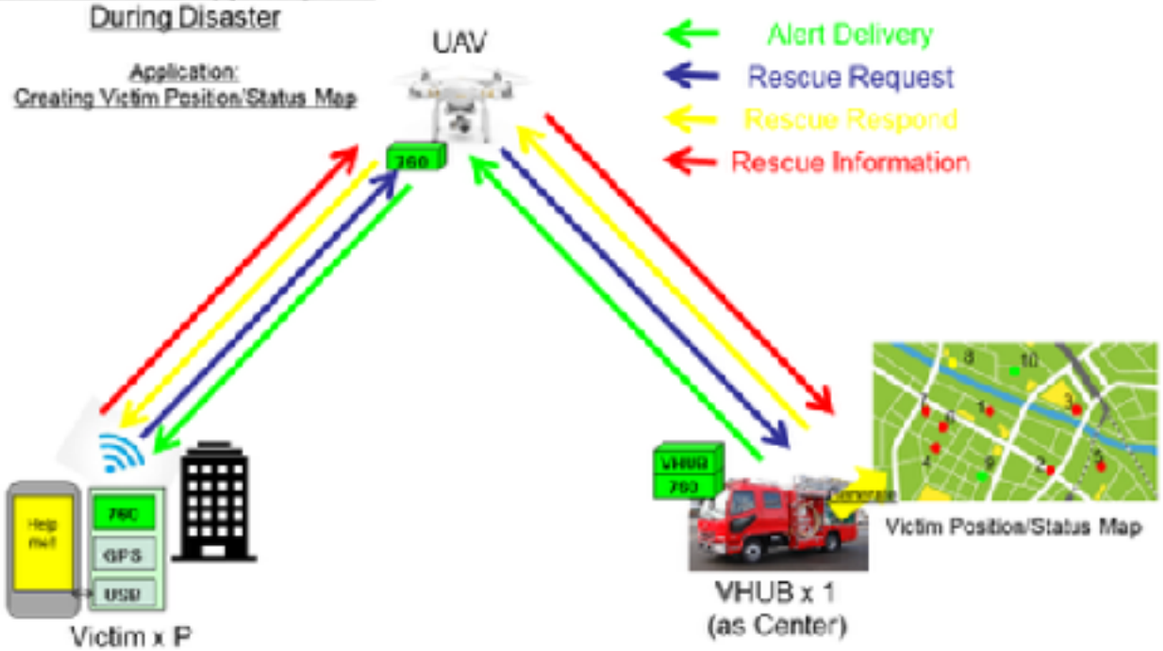


Sponsored by WWF, Philippine ISOC, ISIF-ASIA, DOST, USAID

Philippine Demonstration using VHUB and UAV Victim Rescue Support System with ITS (ARIB STD-T109)

ITS (ARIB STD-T109) devices provide becomes communications for multi-platform operation during evacuation, disaster response, and relief.

ITS (ARIB STD-T109 Equipment was provided through a cooperative research agreement of AIC and Toyota ITC Operations in the Philippines was allowed for experimental use by the NTC Philippines with DICT concurrence.



Smart Phone with
760MHz Tranceiver

VHUB
(PC + 760MHz
Transceiver)

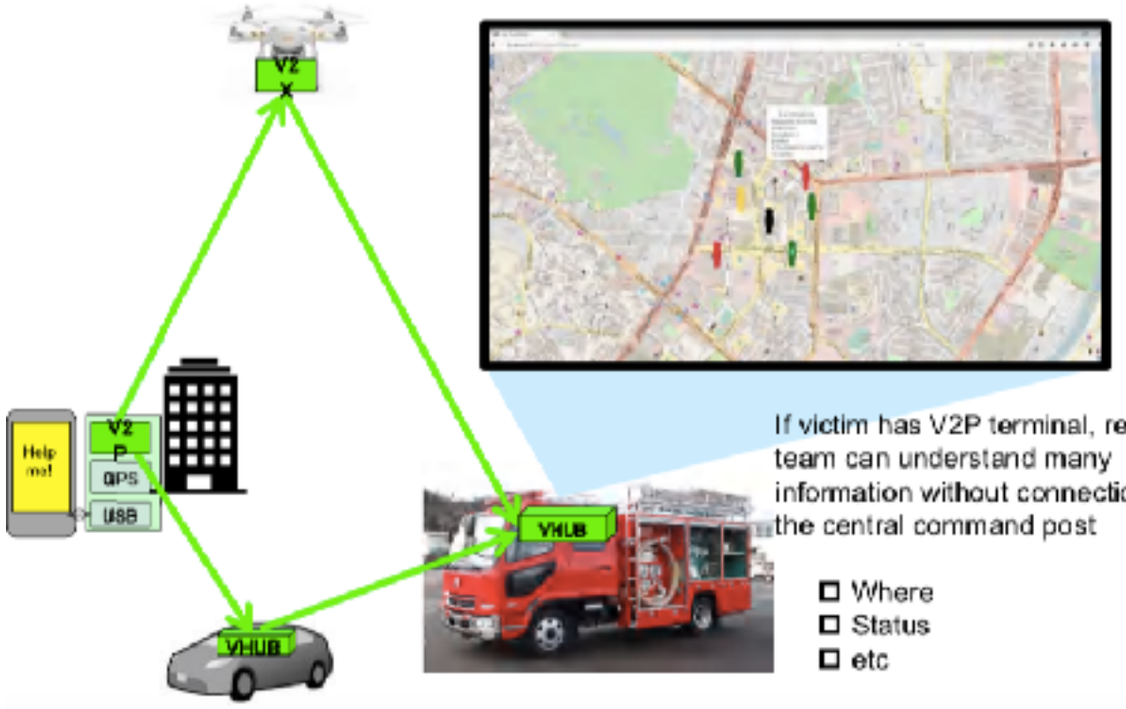
Testing of ITS Devices on New Japanese Frequency for V-Hub in Philippines with valuable approval from DICT

V-P Beacons for Rescue Support

Sub-GHz Frequency - 760 MHz ARIB STD-T109
Vehicle Based Hunting and UAV Hunting
Conform to New Protocol for V-Hub
Buried Transmitters (0.25, 0.5, 0.75, 1.0 m)
Detect Beacon Transmission

STD Number	ARIB STD-T109	2017.10.27
Standard Name	700 MHz Band Intelligent Transport Systems	

Victim rescue support system using V2X



If victim has V2P terminal, rescue team can understand many information without connection to the central command post

- Where
- Status
- etc

-11-

V2P propagation (760MHz) test in Philippines

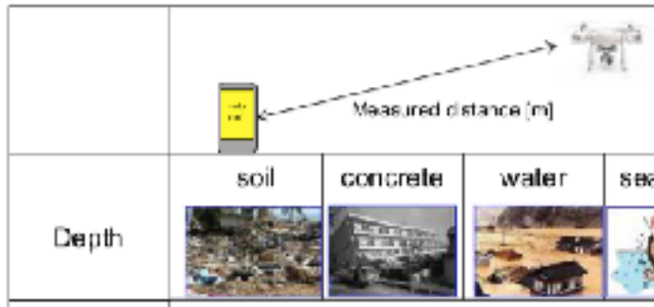
San Juan, Batangas, Philippines

Victim Rescue team

Assumption : Victim may stay under the land

Assumption : soil, concrete, water, seawater

Results of the propagation test in Philippines



Depth	soil	concrete	water	seawater
0m	> 120m(-75dBm)			
0.25m	> 120m	> 120m	> 120m	50m
0.5m	> 120m	> 120m	70m	30m
1m	100m	> 120m	70m	20m

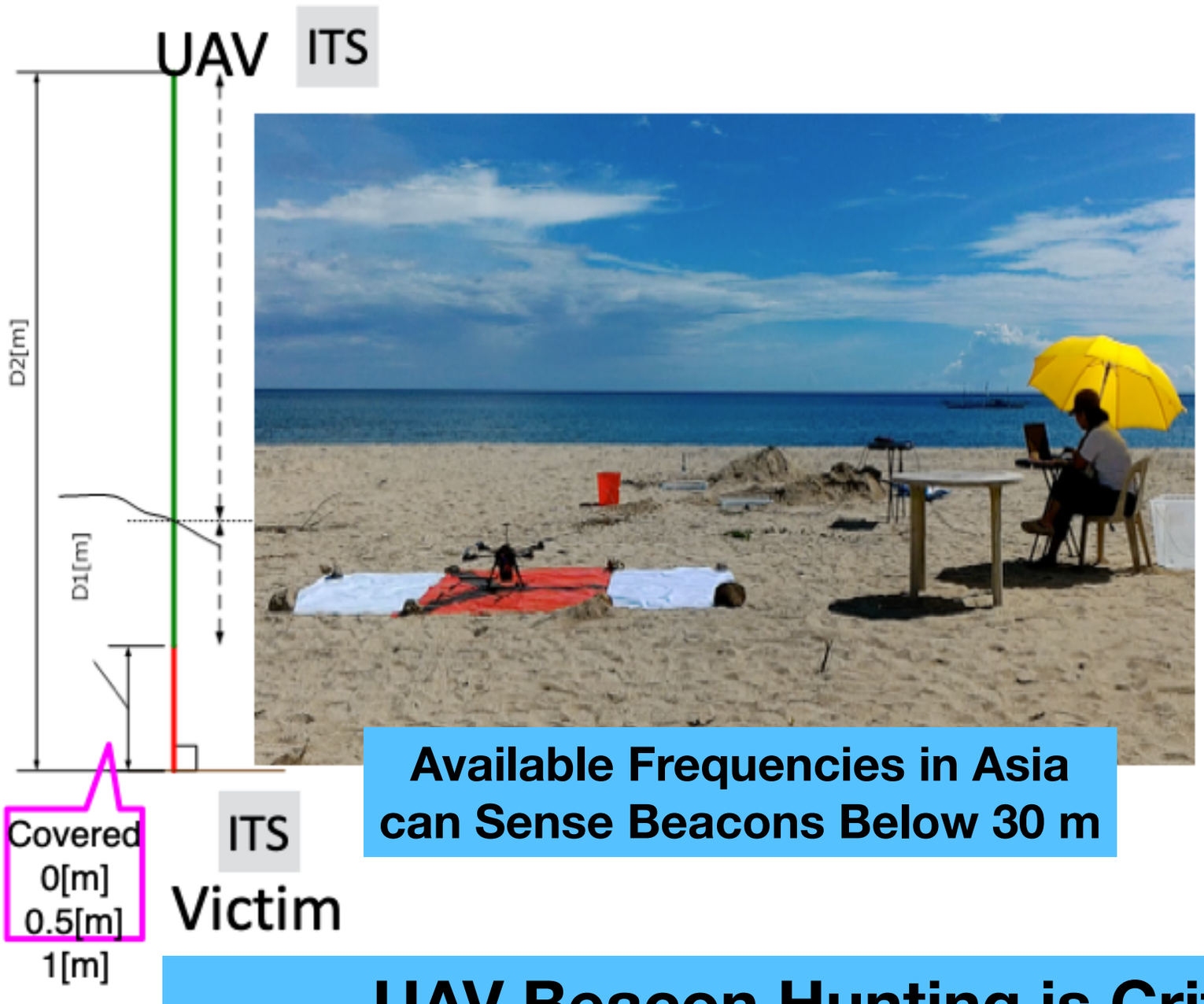
120[m] is limit of Philippines regulation

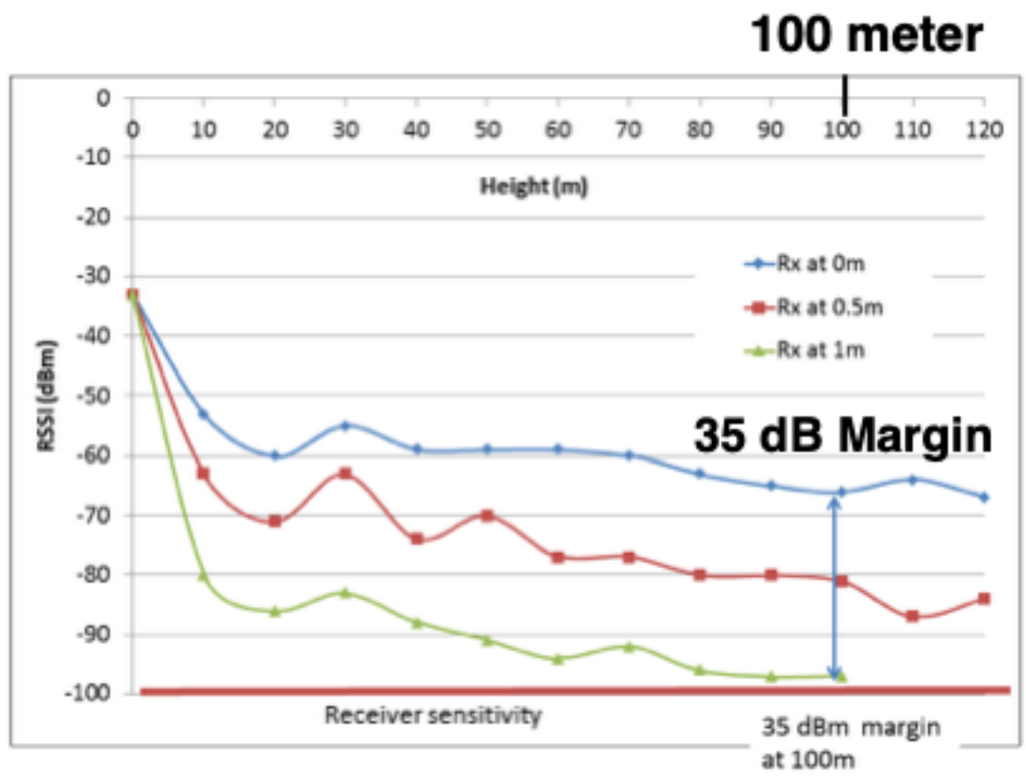
We confirmed that 760MHz V2X can find the victim who has V2P terminal.

If Vehicles Closes to Within 100 meters —> Buried 760 MHz Beacon Detected

UAV Victim Location Experiment

Buried victim location at 0m, 0.5m, and 1m using 760 MHz ITS and UAV





Available Frequencies in Asia can Sense Beacons Below 30 m

UAV with ITS connections can detect victims on the ground and buried underground with better results than VHUB. It can go beyond a height of 100m to detect a victim buried 1m deep.

UAV Beacon Hunting is Critical to Early Response - Sub-GHz Bands Allow Detection of Buried Beacons

Dr. Yoshiharu Doi, Toyota InfoTech Center, Japan

Kevin Sato, Toyota InfoTech, Japan

Tomoki Isaac Saso, Sky Perfect JSAT, Japan

Yasuo Oishi, HONDA, Japan

Dr. N. Libatique, Ateneo Innovation Ctr, Philippines

ASEC A. Silor, DICT, Philippines

Arunsak Nit-In, CAT Telecom, Thailand

N. Tansakul, AIT, Thailand

Dr. Aduwati Sali, UPM, Malaysia

Final Draft Workshop - Submission of ASTAP Recommendation for V-Hub

A common problem encountered during disaster response is the lack of means of communication, with the usual approaches like internet connectivity and cellular networks not functioning properly. This communication problem affects almost everyone involved in the disaster, whether survivor-to-survivor, survivor-to-rescuer, or rescuer-to-rescuer. With the development of vehicle-to-vehicle communication for automated driving, it is relevant to explore other uses of the technology for applications that would involve the use of vehicles.

V-HUB Final Submission Workshop in Philippines

Draft APT Recommendation on “Standard Specification of Information and Communication System using Vehicle during Disaster” was approved as the Second APT Recommendation by the 42nd session of Management Committee, Asia-Pacific Telecommunity (APT) on 12 October, 2018. 😀

Philippine Use Case for V-Hub Standard

V-Hub Standard and V2X Technology will play in Disasters such as survivor transport, victim finder, power plant, communications hub, and information kiosk.

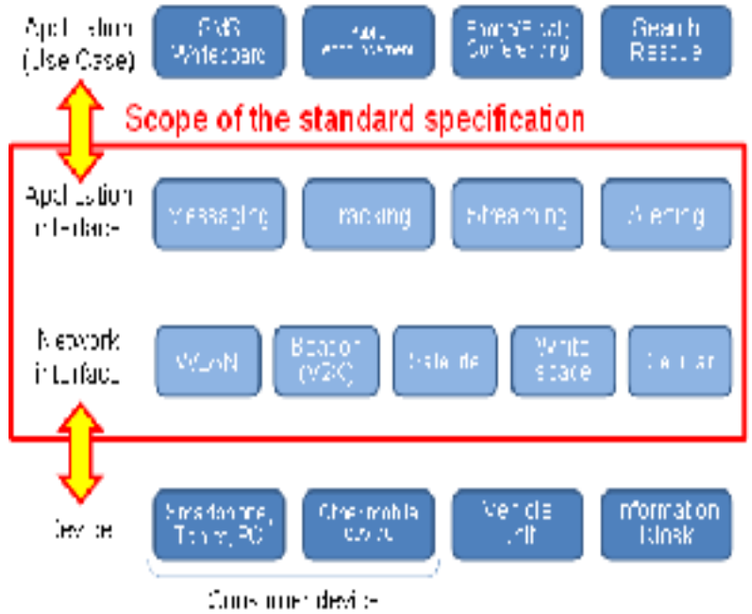
LoRa Beacon Transponders in Sub-GHz Band can be viable for Practiced Evacuation and Finding of Survivors because of penetration of debris.

Cooperative Operations of UAVs and UGVs for Practiced Evacuations, Situational Awareness and Mission Planning

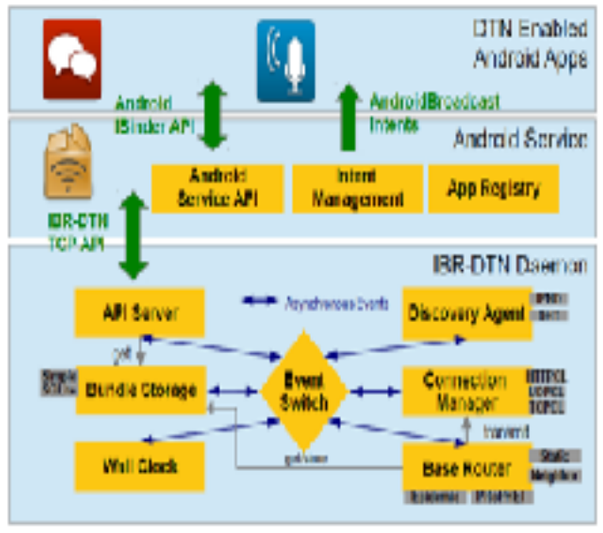
Delay Tolerant Networks plus Mobile Cloud Caching for Information Gathering with Always Ready Radio and Ad-Hoc Wifi.

Crucial Applications Implemented in the Field - Facial Recognition, Damage Assessment by Aerial Imaging and Sensor Networks, Rapid Kiosks for Evacuation Center / Disaster Medicine

ASTAP V-Hub Specifications



DTN Apps for V-Hub Standard

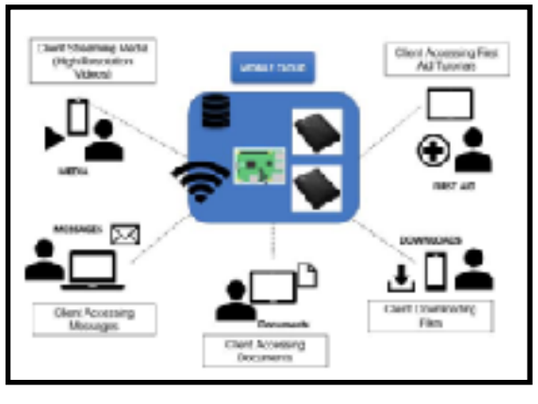


Demonstrated Capabilities Important for Disaster Resilience

LoRa Beacon Communications

V-X Comm with DTN

UAV Imaging / Data Ferries



Mobile Cloud / Caching

Situational Awareness over Wide Field - Cooperative UAV and V-Hubs for Beacon Comm, Imaging and Data Ferries

UAV with Aggregator and V-Hub With Mobile Cloud

UAV

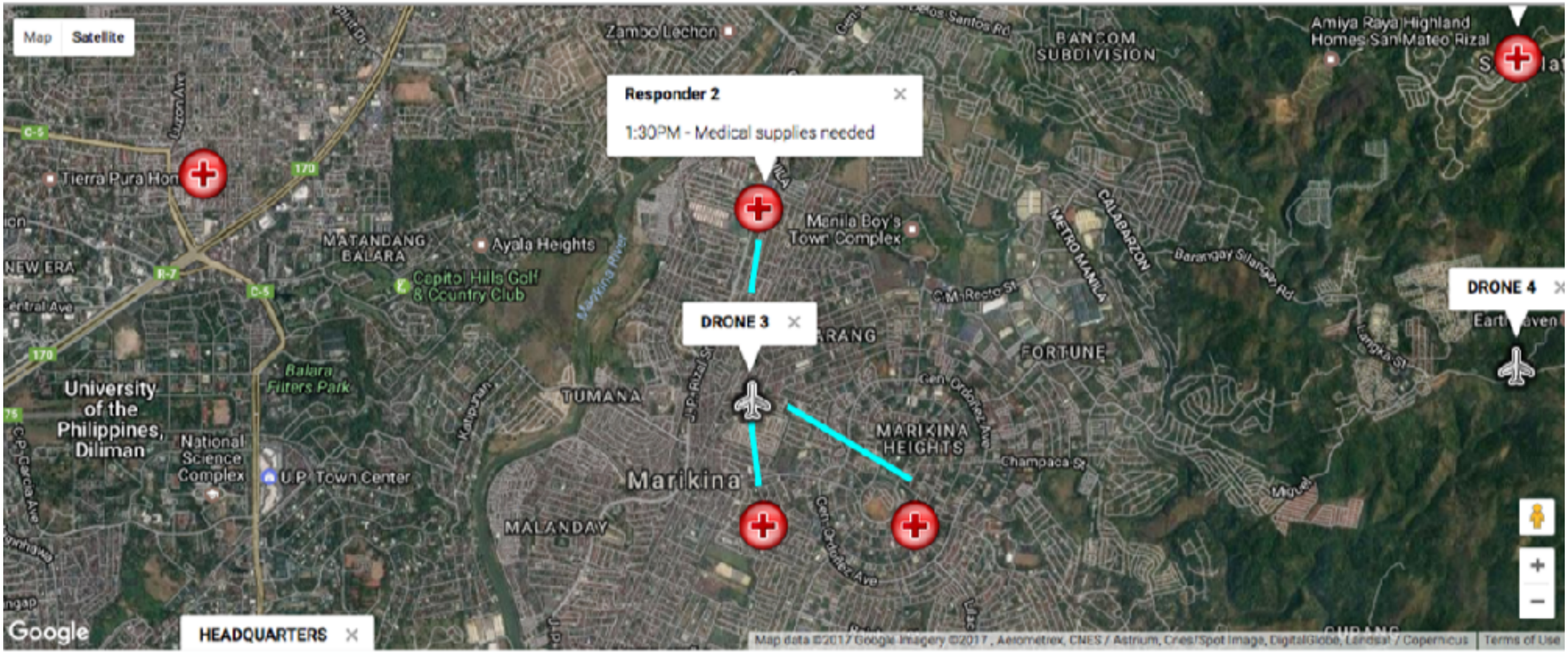
LoRa Beacon
Data Aggregator

V-Hub with Mobile Cloud

Mobile Unit with UAV Launch and Mobile Cloud Caching/Processing

Simulated Information Flow During Disaster

Time, Location, Data on Mission Map



RESPONDERS / V-HUB

Bumping data via WIFI

Apps using Near Cloud Cache

Sub-GHz Radios

IMAGER /DATA RELAY

UAV

Imager

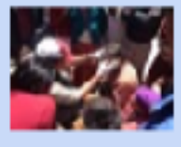
Sub-GHz Comm

Wide Area Beacon

MISSION CONTROL

Survivor ID / Alert

Mapping



Medical Info

COMMUNICATIONS

LoRa

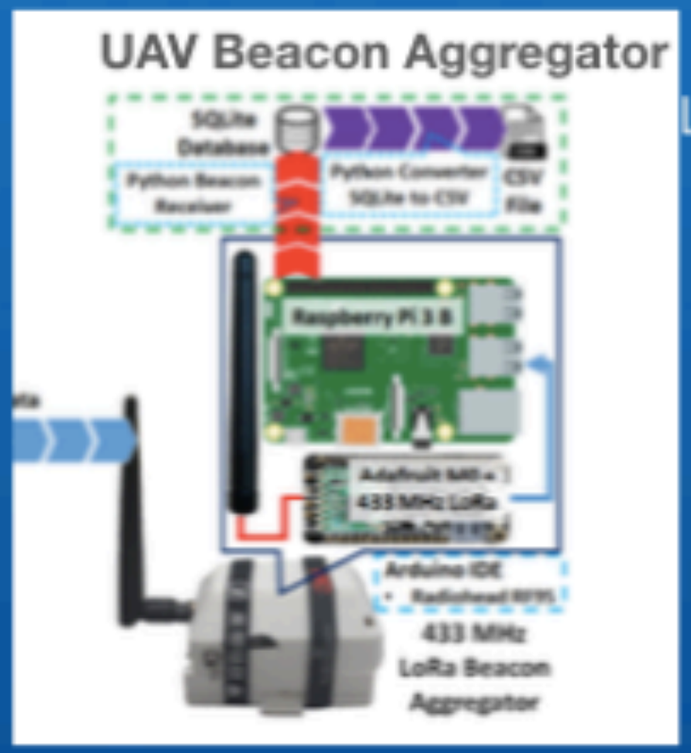
433 MHz

760/915MHz

V-Hub Beacon Communicator for Situational Awareness

Remote Location

UAV Beacon Aggregator



Adafruit Feather M0 RFM95 LoRa Radio A

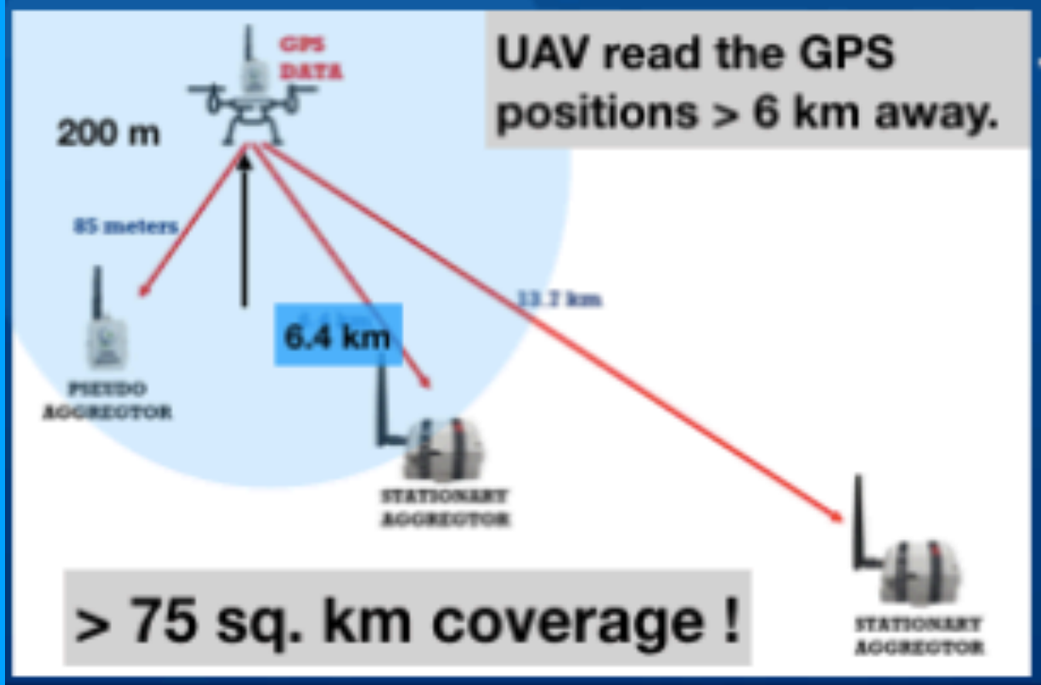
Adafruit Ultimate GPS Featherwing

ARM Cortex M0 processor

Excellent GPS Tracking (-165 dB) on 66 channels

433 MHz // USB/Serial Data

Mobile Unit with UAV Launch and Mobile Cloud Caching/Processing



UAV read the GPS positions > 6 km away.

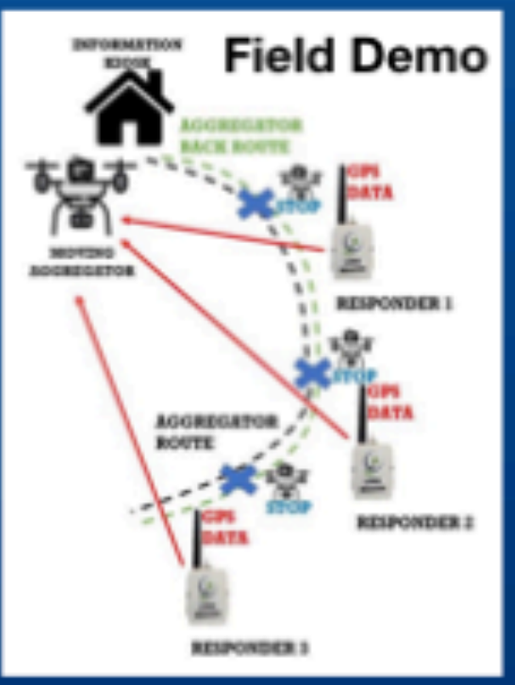
> 75 sq. km coverage !

Time ID GPS Message

19/10/2019 16:44	6	1438.636 N	12104.85 E	3/8/1998:Gabo:20:Male:Debris on my legs. Im trapped.	
18/11/2018 14:46	2	1417.304 N	12102.58 E	1992|208:bob:35:male:help need food	
18/11/2018 14:46	4	1417.3 N	12102.58 E		
18/11/2018 14:46	1	1417.3 N	12102.58 E		
18/11/2018 14:46	5	1417.302 N	12102.57 E		
18/11/2018 14:47	6	1417.3 N	12102.57 E		
18/11/2018 14:47	3	1417.306 N	12102.57 E		
18/11/2018 14:47	2	1417.304 N	12102.58 E		

Actual Received Data from Field Trials

Field Demo



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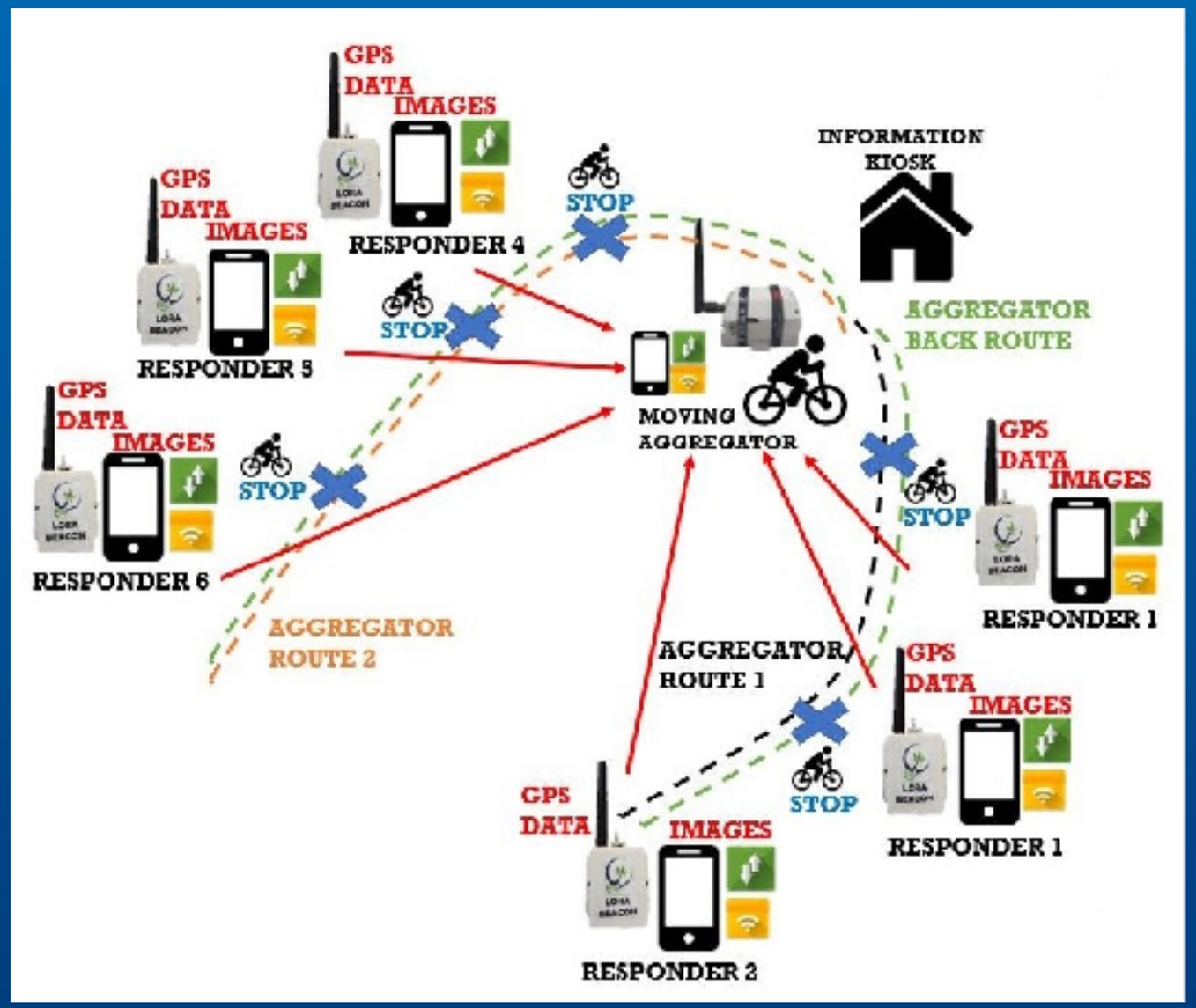
PHILIPPINES

System Demonstration

Carmona Deployment 1 - November 17, 2018

Post-Disaster Simulaton with Ground Mobile Agregator

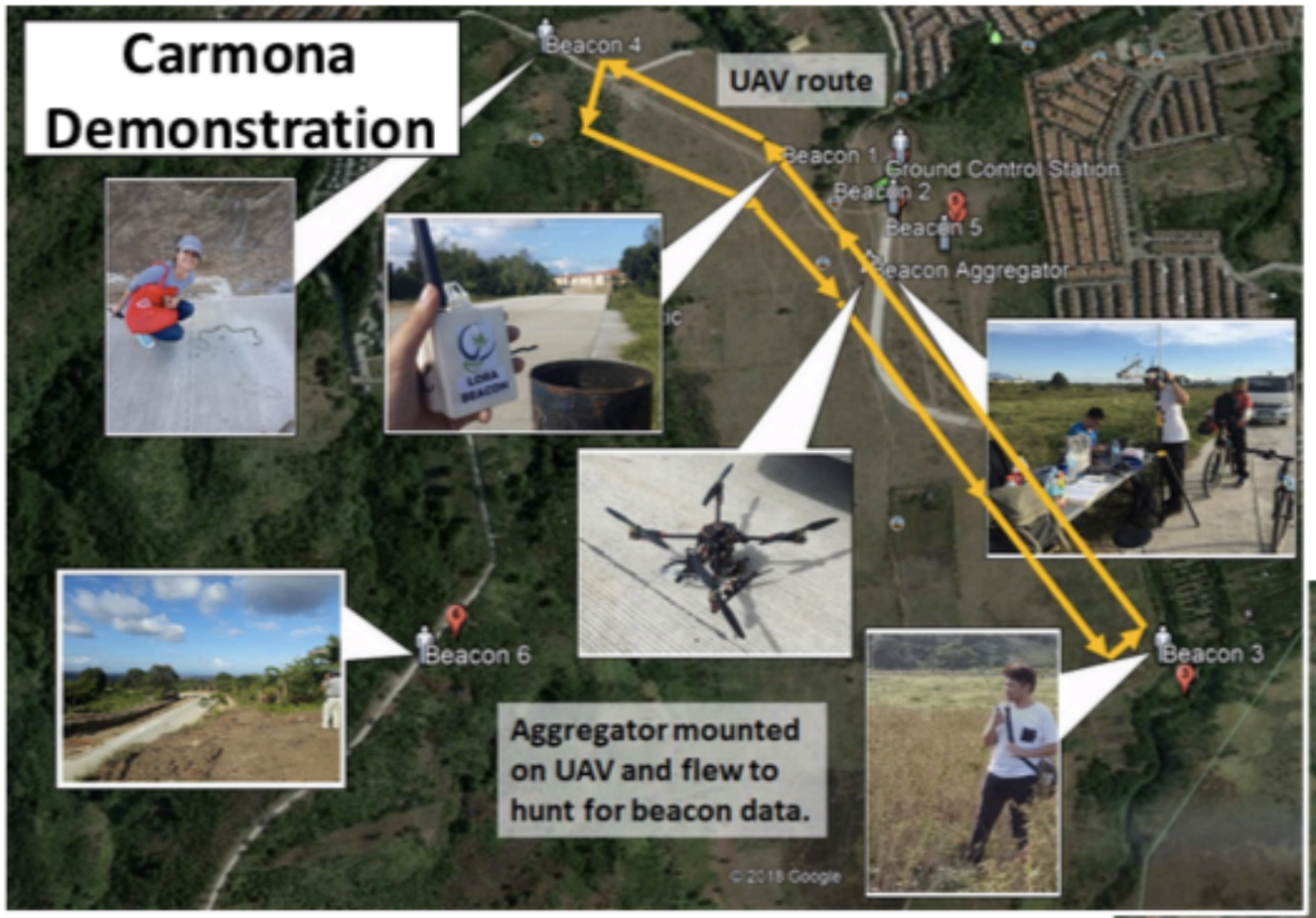
- Six Responders scattered to varying ranges in Carmona
  - LoRa Beacon
  - Phone with IBR-DTN and ShareBox
- Moving Responder going in range of the six responders to obtain data
  - Aggregator
  - Phone with IBR-DTN and ShareBox
- Information Kiosk



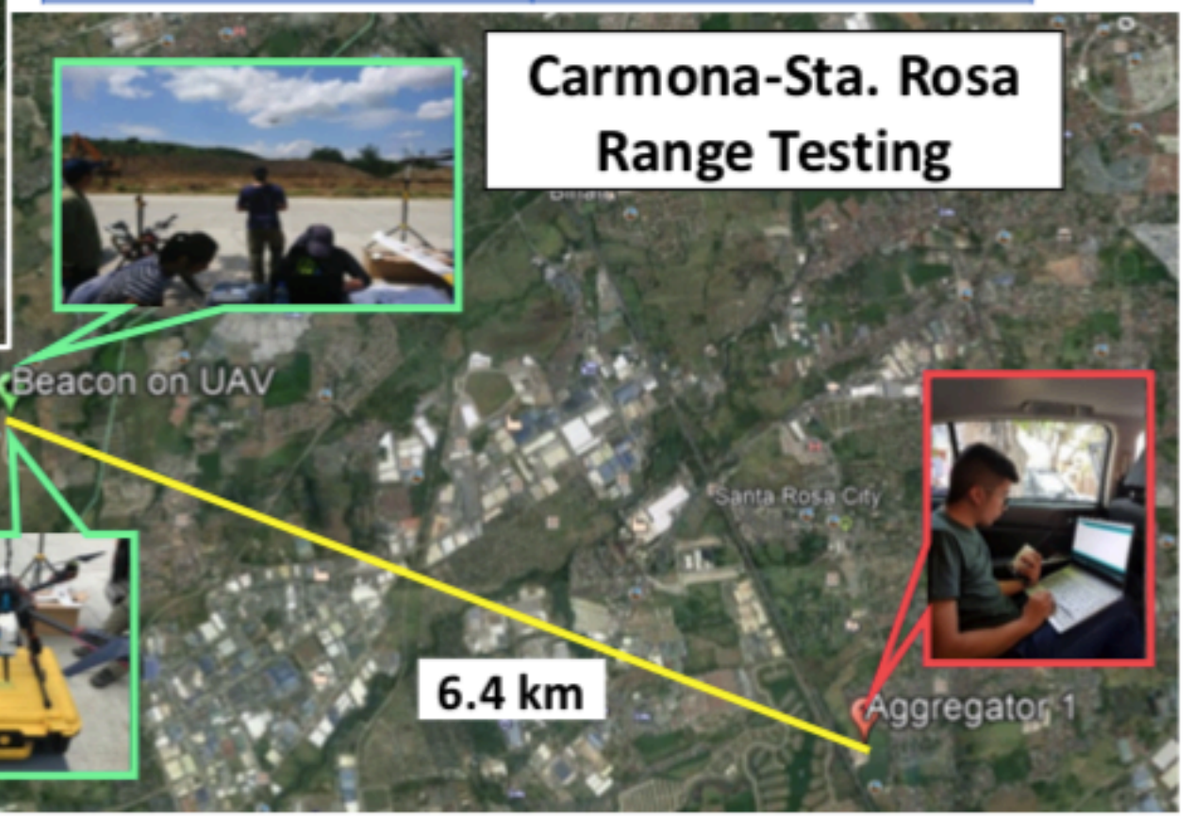
IBR-DTN - Carmona Deployment 1

Bandwidth = 125kHz	Spreading Factor = 7	Coding Rate = 5

V-Hub Deployment in Philippines - UAV Beacon Hunting



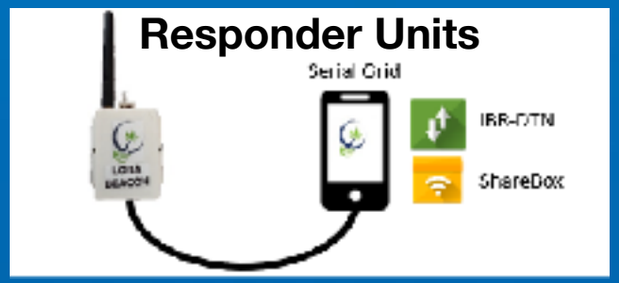
UAV Altitude	120-200 m
Tx Power	23 dBm
Rx Sensitivity	-124 to -133 dBm
Spreading Factor	7-10
Bandwidth	125 kHz
Coding Rate	4/5

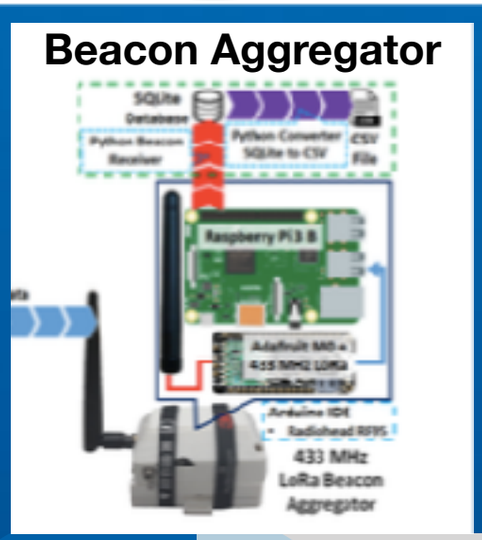


LoRa Beacon Hunting UAV Deployment

- Beacons were dispersed throughout the field.
- Aggregator mounted on a flying UAV.
- When in range, beacons transmit location and message to aggregator.

V-Hub Beacon Communicator for Situational Awareness

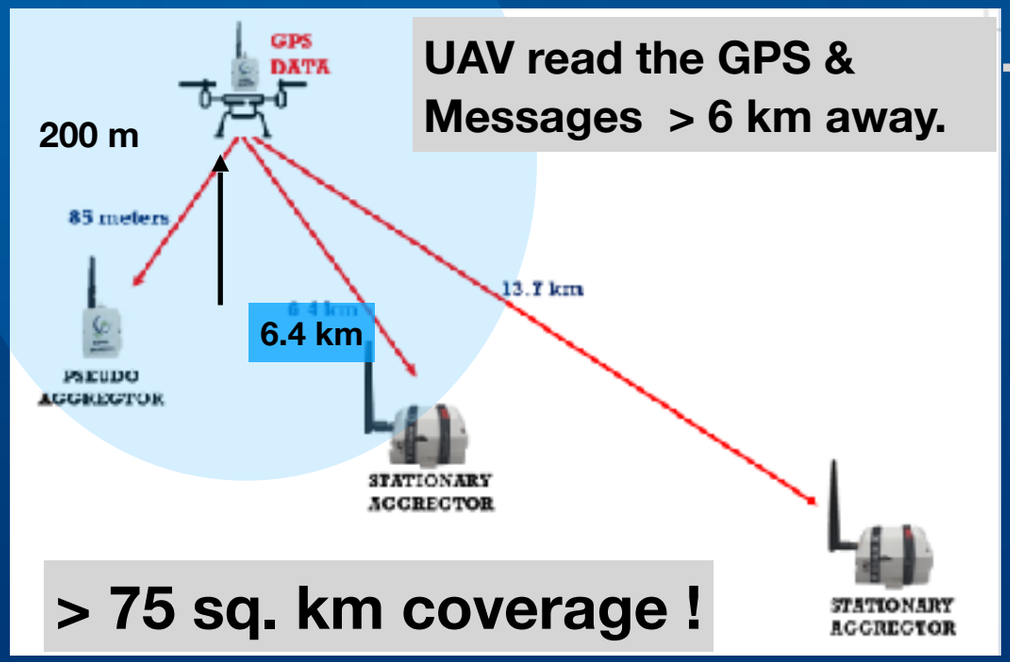

Responder Units


Beacon Aggregator

Aggregator + Mobile Cloud
915 MHz Communicator
DTN Data Hub/Procesing
Mission Control

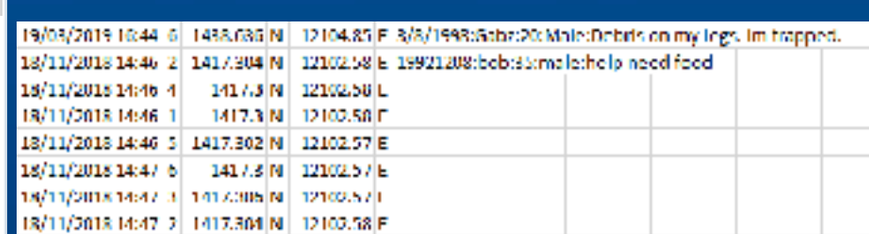
Multi-Rotor UAV
with Beacon Receiver

Mobile Unit with UAV Launch and Mobile Cloud Caching/Processing


UAV read the GPS &
Messages > 6 km away.

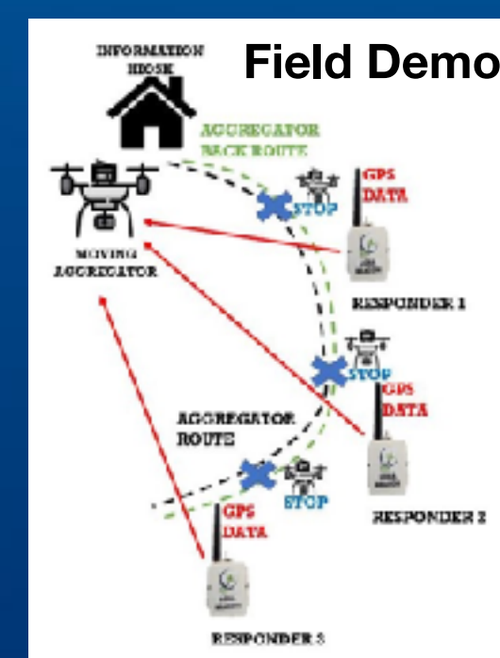
> 75 sq. km coverage !

Time ID GPS Message

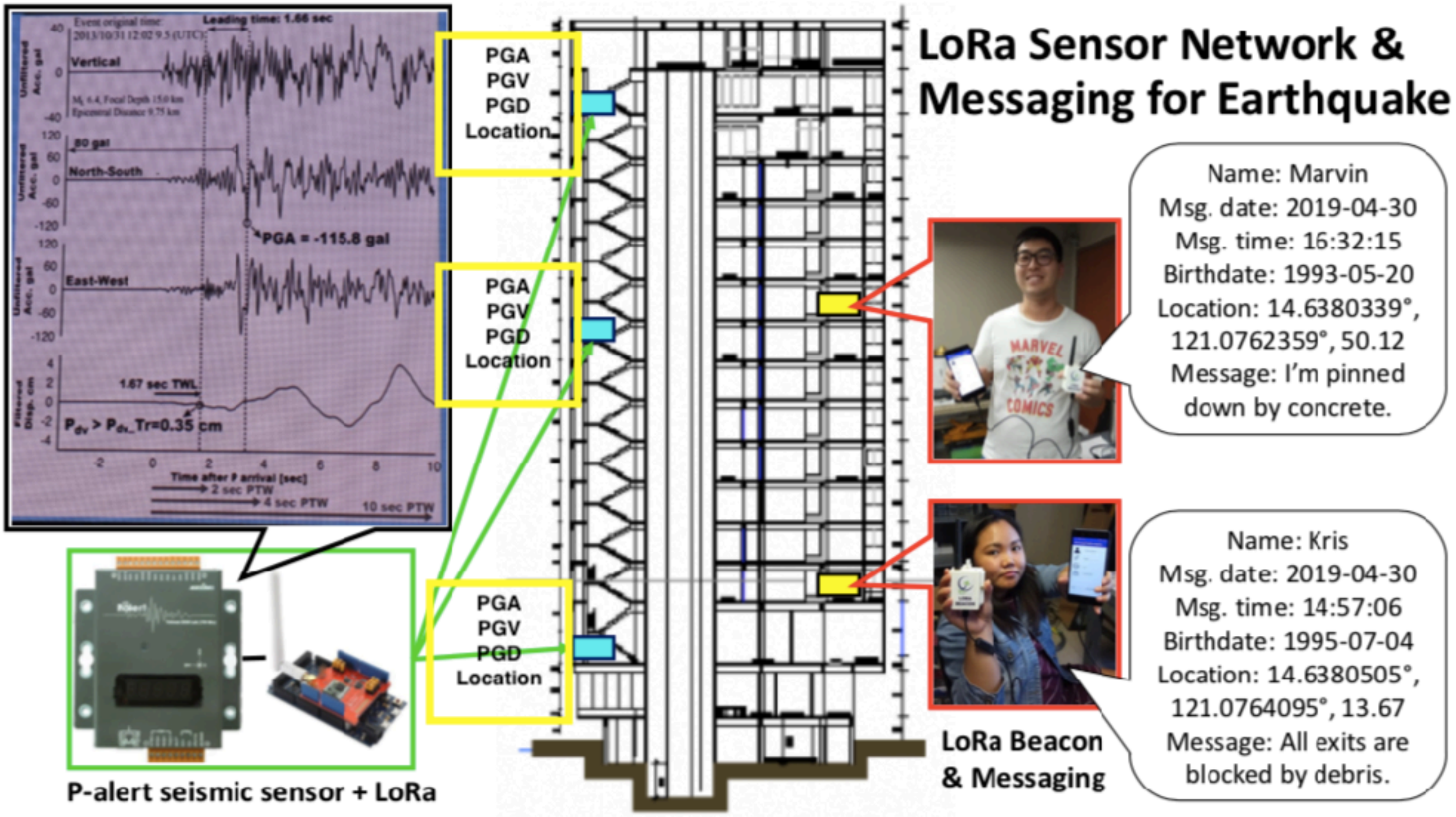


19/03/2019 16:44	6	1438.636	N	12104.85	F	3/8/1998:Gabz:20:Male:Debris on my legs. Im trapped.				
18/11/2018 14:46	2	1417.304	N	12102.58	E	19921208:bob:35:male:help need food				
18/11/2018 14:46	4	1417.3	N	12102.58	E					
18/11/2018 14:46	1	1417.3	N	12102.58	E					
18/11/2018 14:46	5	1417.302	N	12102.57	E					
18/11/2018 14:47	6	1417.3	N	12102.57	E					
18/11/2018 14:47	3	1417.305	N	12102.57	E					
18/11/2018 14:47	2	1417.304	N	12102.58	F					

Actual Received Data
from Carmona Field Trials


Field Demo

Earthquake Application of LoRa Beacon Communications

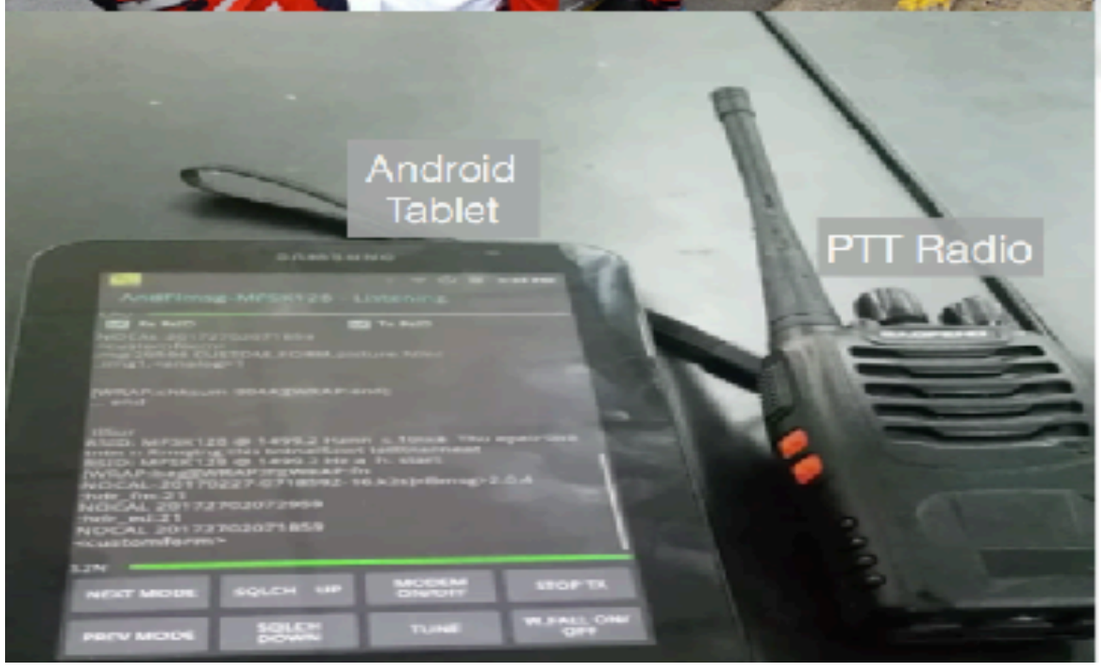


Sensors provide Peak Ground Acceleration, Velocity, Displacement (PGA,PGV,PGD) over LoRa. Isolated Residents can Message using LoRa Communicators, if wireless services are down.

APT Industry Workshop, Tokyo, Japan , June 11, 2019

Data Transmission Via Low Cost PTT Radio

ATENEO EMERGENCY RESPONSE TEAM
PTT RADIO IMAGE TRANSMISSION, 25 FEBRUARY 2017



EMERGENCY TEAM TRANSMIT TO HOSPITAL NAME. VITAL SIGNS, IMAGES OF INJURIES, TEXT TIME, GPS LOCATION, ETA AT HOSPITAL

RESPONDERS CAN PROCESS INFORMATION USING CACHED CONTENT WITH APPS √

Data Transmission Via Low Cost Radio

PTT Radio for Facial Recognition w/ Facebook

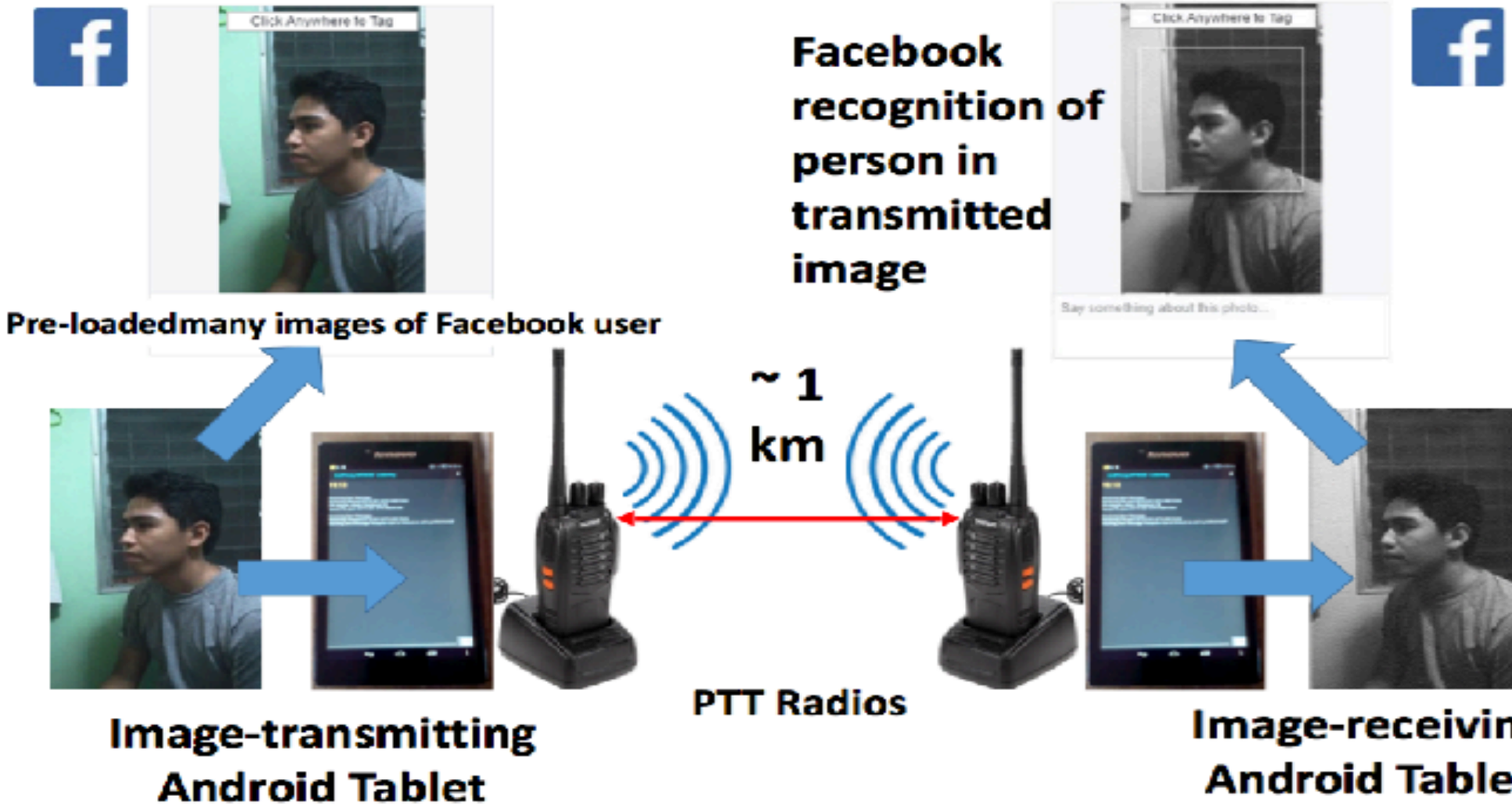


Image Quality is Fine for Face Recognition !

Philippine Use Case for V-Hub Standard

V-Hub Standard and V2X Technology will play in Disasters such as survivor transport, victim finder, power plant, communications hub, and information kiosk.

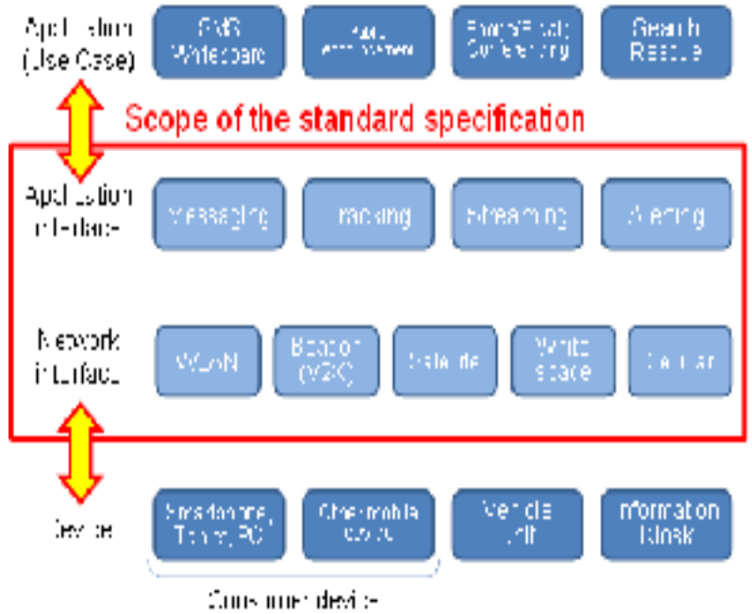
LoRa Beacon Transponders in Sub-GHz Band can be viable for Practiced Evacuation and Finding of Survivors because of penetration of debris.

Cooperative Operations of UAVs and UGVs for Practiced Evacuations, Situational Awareness and Mission Planning

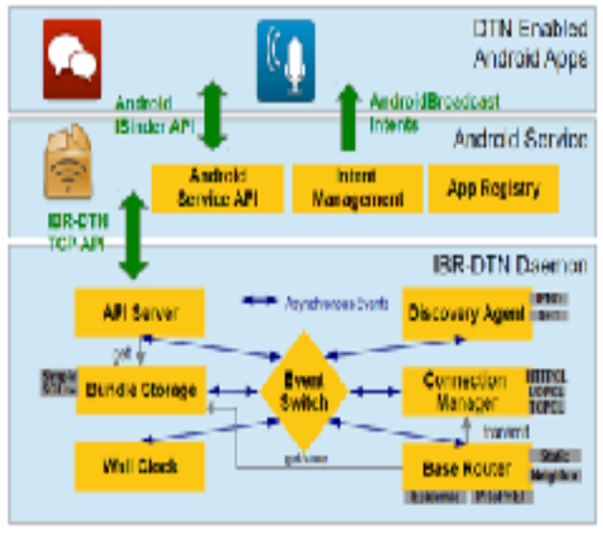
Delay Tolerant Networks plus Mobile Cloud Caching for Information Gathering with Always Ready Radio and Ad-Hoc Wifi.

Crucial Applications Implemented in the Field - Facial Recognition, Damage Assessment by Aerial Imaging and Sensor Networks, Rapid Kiosks for Evacuation Center / Disaster Medicine

ASTAP V-Hub Specifications



DTN Apps for V-Hub Standard

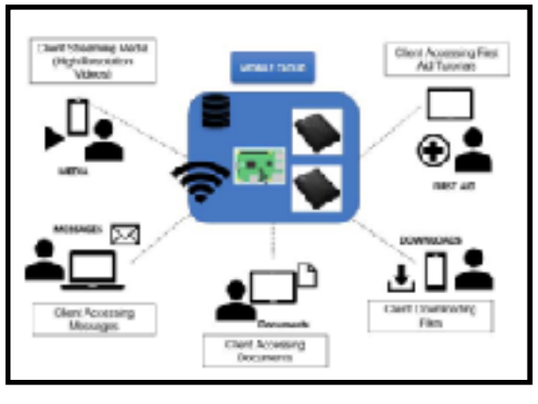


Demonstrated Capabilities Important for Disaster Resilience

LoRa Beacon Communications

V-X Comm with DTN

UAV Imaging / Data Ferries



Mobile Cloud / Caching

DTN in a Disaster Response with V-HUB and UAVs

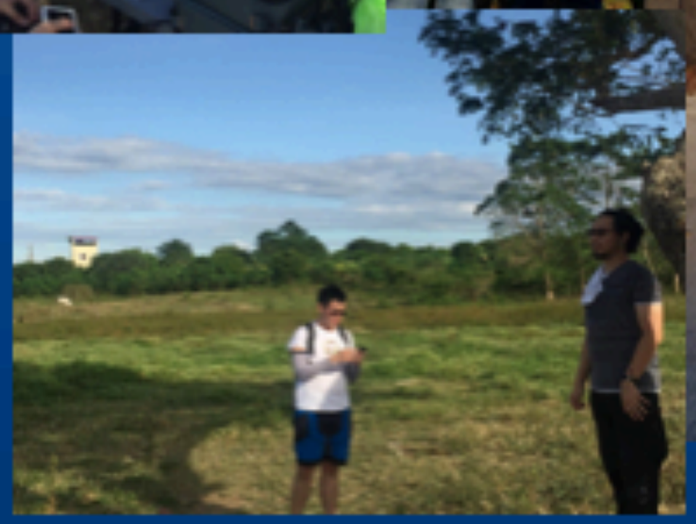
Responders sharing photos and messages using phones and radios
V-HUB provides Power, Mobile Cloud, Sub-GHz Radio Comm, WiFi, Safe Transport
Lead Responder can Relay Team Data to UAVs and V-Hub by Sub GHz Radio

UAV1

Ateneo Innovation Center

Team - Carmona Deployment

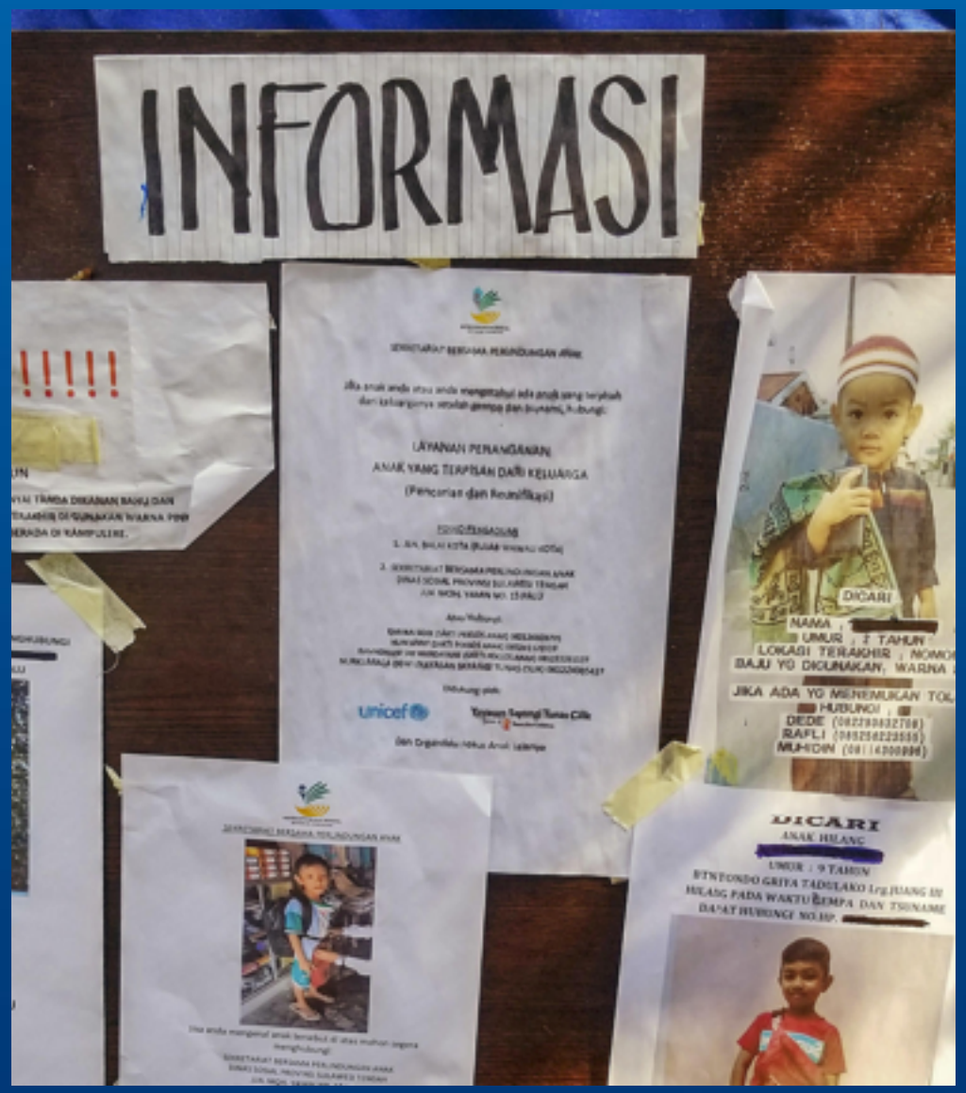
November 16 - 18, 2018; February 22 - 24, 2019

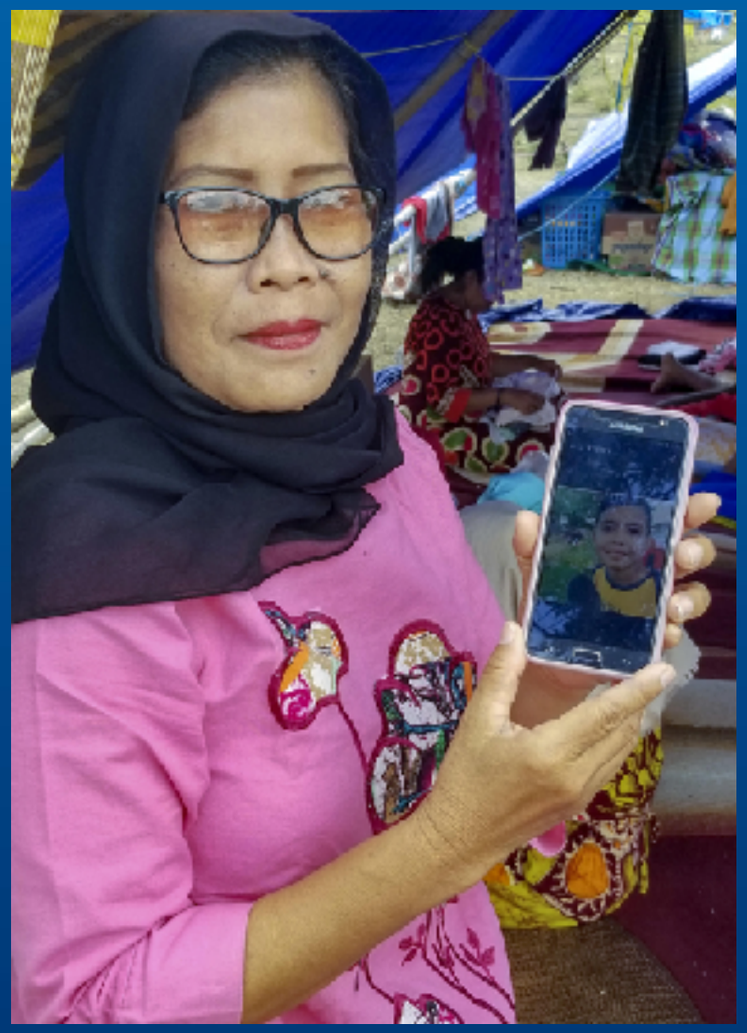


ATENEO DE MANILA UNIVERSITY
PHILIPPINES

Improved Readiness with Enhanced V-Hub Technology

- Location & identification of survivors/ Family Reunification
- Rapid Situational Awareness over Large Area
- Prepositioning of Data in Mobile Clouds
- Multi-Platform Integration of Communications / Data





Delay Tolerant Networking Application - Identifying Victims / Survivors

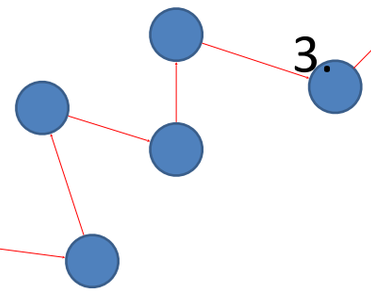
Near Cloud in V-Hub gets data
Runs recognition algorithm to identify survivor(s)

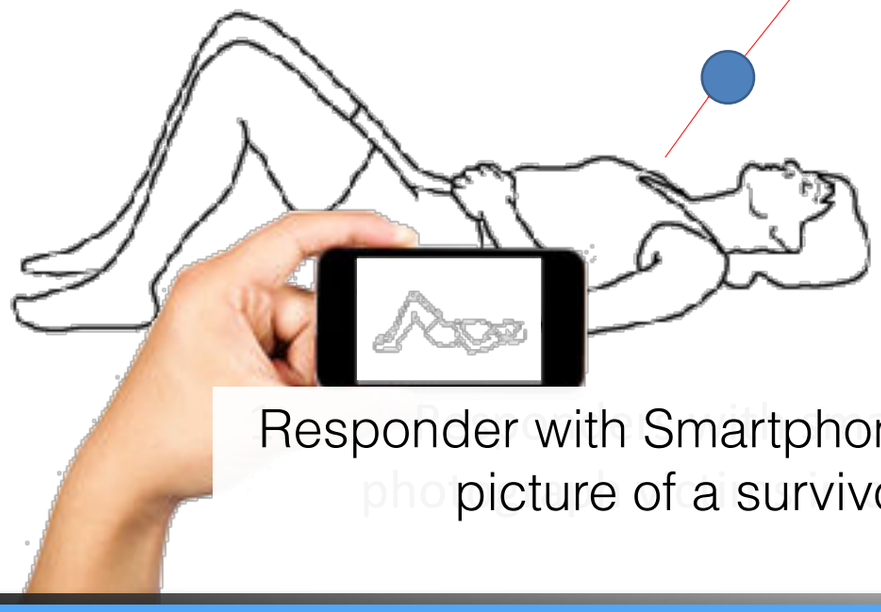
- Account for victims

Mobile Cloud

3. When a responder comes into contact range with a near-cloud

Collected Data Transferred through DTN





Responder with Smartphone takes a picture of a survivor

Data Uploaded to V-Hub and New Data Downloaded to Responders

*Trained animals can also find and photograph victims and deliver data to near-cloud vehicles

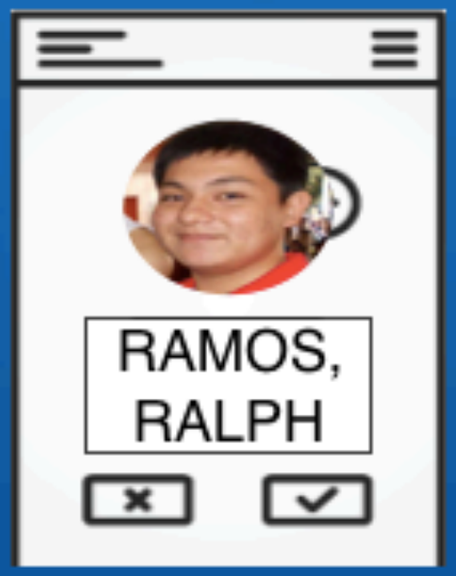
DTN for Disaster Response

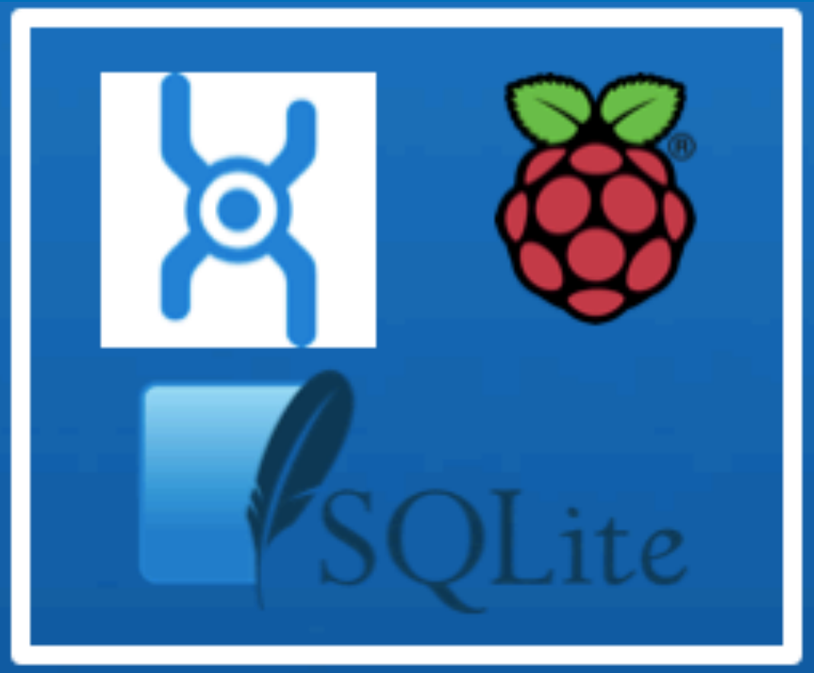
NAIST Ubiquitous Computing Systems Laboratory

Develop features based on scenarios

Carmona deployment (11/16/18-11/18/18)

Identity Recovery



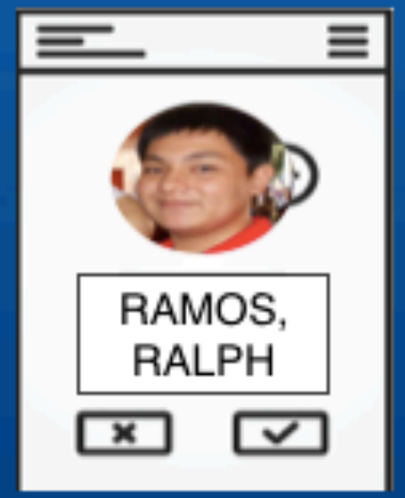


Caching info on citizens

Info from responders via RF

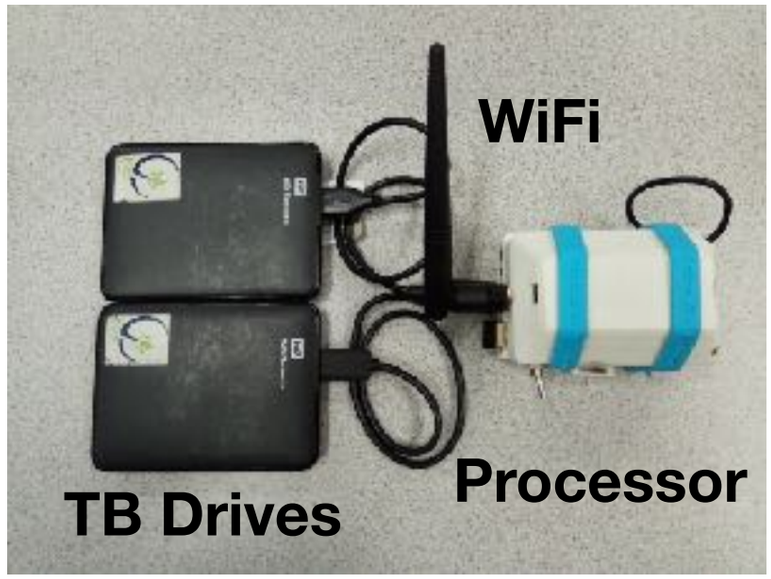
Near Cloud node

runs facial recognition



if match, output info on person

Mobile Cloud in V-Hub - Identifying Survivors



TeraByte Cached Content

HD Maps (Flood / Aerial)

Disasters Information

Medical Information

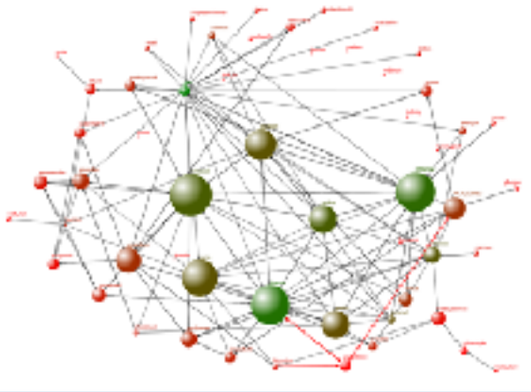
Face Recognition

Social Context

Reunite Families
Rebuilding ID

Social Network Gallery

Social Contextual Information



Name is Adam Gonzales.
Gonzales Family in Sabang.
Barrio Hidalgo School

Evacuation Centers

Relief Operation Sites

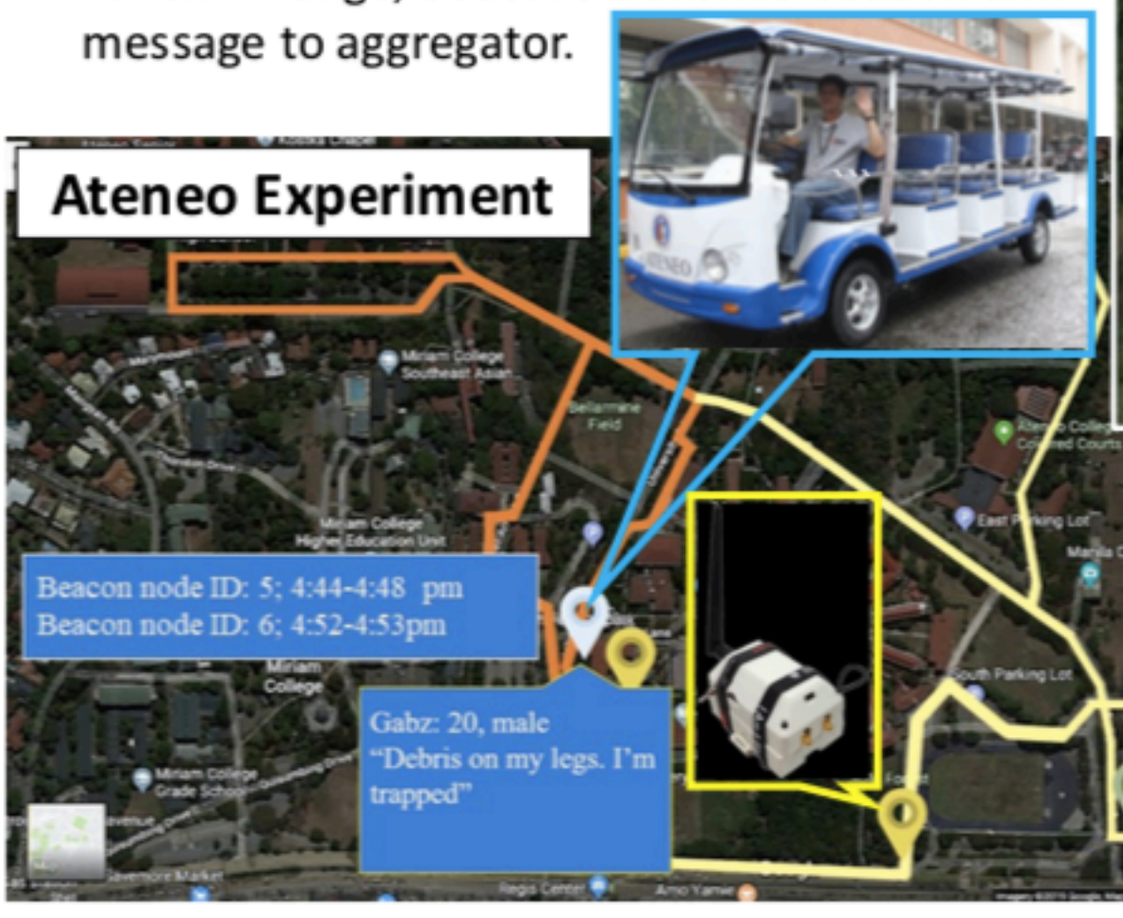
Survival Kit Tutorial

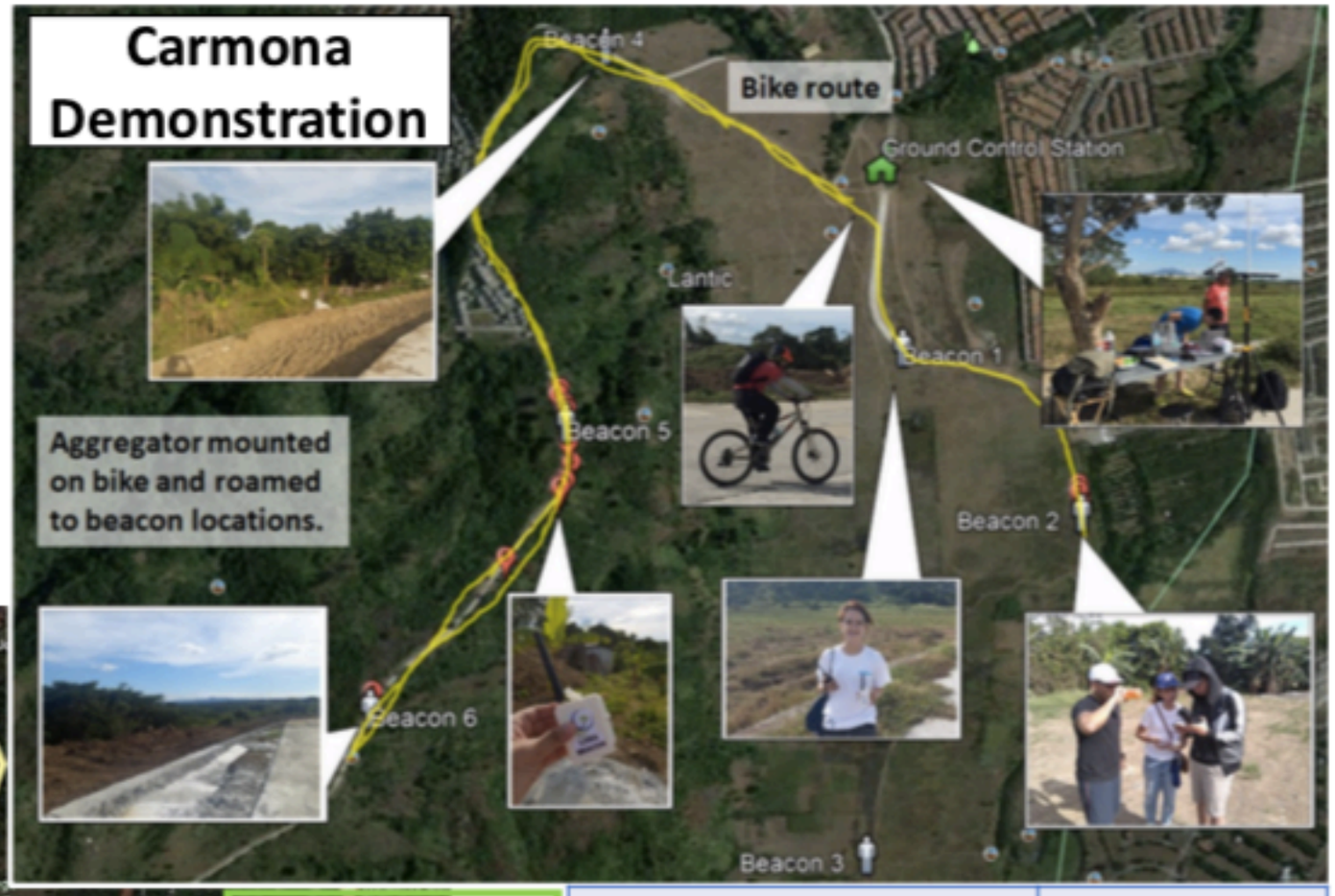
V-Hub Tech

V-P Messaging Beacons with LoRa and DTN Data Sharing

LoRa Beacon Hunting Ground Deployment

- Beacons were dispersed throughout the field.
- Aggregator placed in a moving vehicle – bicycle or E-Jeep.
- When in range, beacons transmit location and message to aggregator.





Tx Power	23 dBm
Rx Sensitivity	-124 dBm
Spreading Factor	7
Bandwidth	125 kHz
Coding Rate	4/5

Mobile Cloud Data Transfer Between Aggregators

E-Jeepney
Mobile Cloud
Data Ferry

Ad-Hoc WiFi (2.4 GHz)
RFD 900 (915 MHz)

UAV

Mobile Cloud
LoRa Beacon RX
DTN Server WiFi
w/ TB Cache

Images
Messaging
Voice Recordings

Ground to Ground
Ground to UAV

Images
Messaging
Voice Recordings

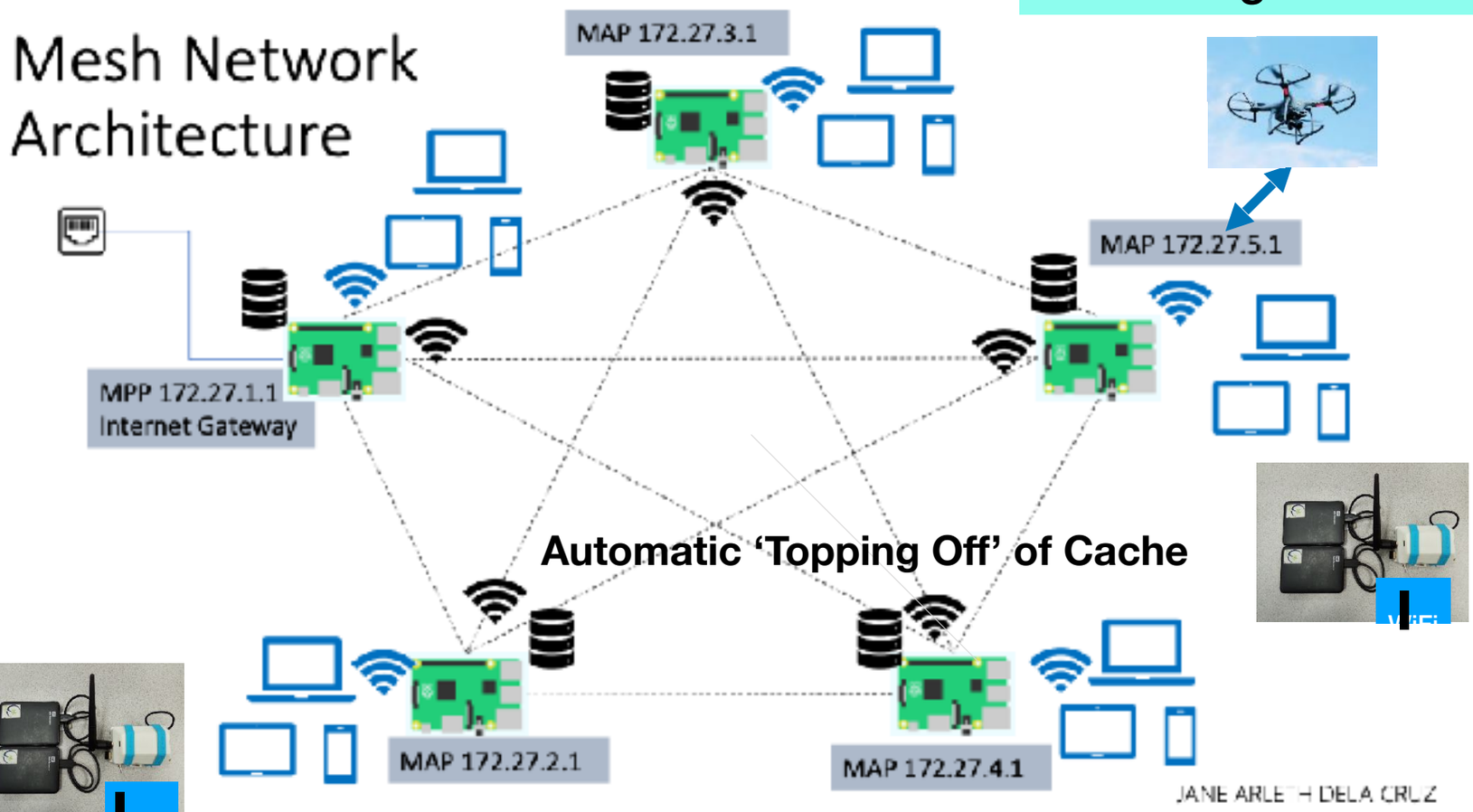
Images
Messaging
Voice Recordings

Images
Messaging
Voice Recordings

Images
Messaging
Voice Recordings

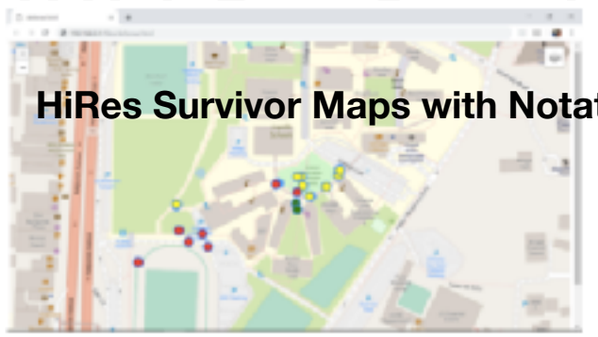
Images
Messaging
Voice Recordings

Mobile Clouds and UAV Ferry Exchanging Data in Wireless Mesh



UAV Imager & Data Ferry

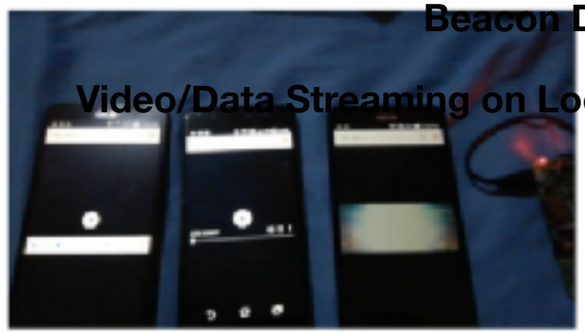
Automatic 'Topping Off' of Cache



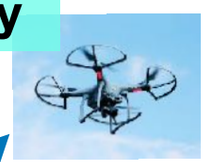
HiRes Survivor Maps with Notation on

Beacon Data

Video/Data Streaming on Local WiF



UAV Imager & Data Ferry



MIMO FOR WiFi MESH

EMERGENCY VEHICLES IN MOBILE CLOUD MESH

WiFi

3 Mesh Nodes are Connected to Each other

```
pi@raspberrypi:~ $ sudo batctl n
[B.A.T.M.A.N. adv 2016.4, MainIF/MAC: wlan1/50:3e:aa:59:0d:c0 (bat0/ee:64:d4:50:68:6b BATMAN_IV)]
IF             Neighbor              last-seen
      wlan1     b8:27:eb:24:03:d1    0.440s
      wlan1     b8:27:eb:12:59:4b    0.650s
pi@raspberrypi:~ $ sudo batctl o
[B.A.T.M.A.N. adv 2016.4, MainIF/MAC: wlan1/50:3e:aa:59:0d:c0 (bat0/ee:64:d4:50:68:6b BATMAN_IV)]
   Originator        last-seen (#/255) Nexthop           [outgoingIF]
   b8:27:eb:24:03:d1    0.610s   (146) b8:27:eb:12:59:4b [      wlan1]
 * b8:27:eb:24:03:d1    0.610s   (192) b8:27:eb:24:03:d1 [      wlan1]
   b8:27:eb:12:59:4b    0.810s   (115) b8:27:eb:24:03:d1 [      wlan1]
 * b8:27:eb:12:59:4b    0.810s   (239) b8:27:eb:12:59:4b [      wlan1]
pi@raspberrypi:~ $
```

JANE ARLETH DELA CRUZ

Caching Data in a ‘Near Cloud’ - In-Flight Entertainment / Maps

Zero Instantaneous Bandwidth to Passengers from Ground !

100’s of GB’s of Cached Content Available In Flight

Passengers Enjoy Hundreds of HD Movies, TV Programs, News, Games
High Resolution Maps Updated with Metadata - GPS, Speed, Direction
Flight Safety Films, Shopping, and Announcements
Cabled or WiFi Delivery in Flight

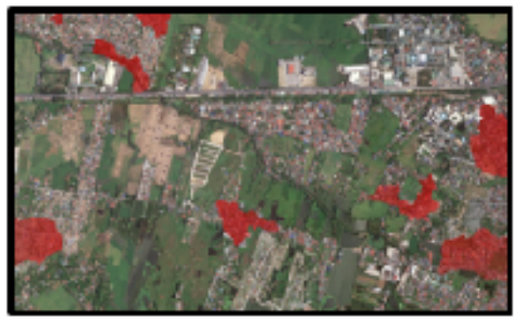
Flood Maps Rendering for Practiced Evacuations/ Early Response

Prepositioning Aerial Maps and Flood Maps

Aerial Maps and Flood Maps are cached in the near cloud

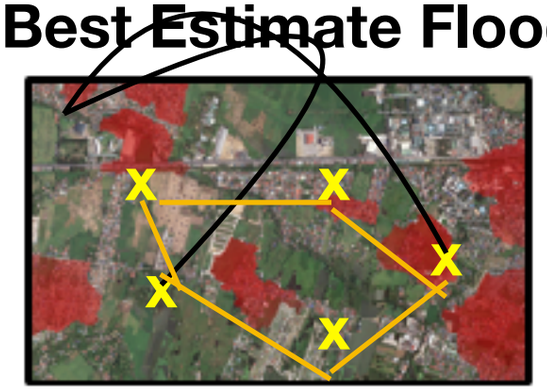
Near Cloud Module

On the ground information is sent to the command center by responders



Flood Scenario 1

Best Estimate Flood



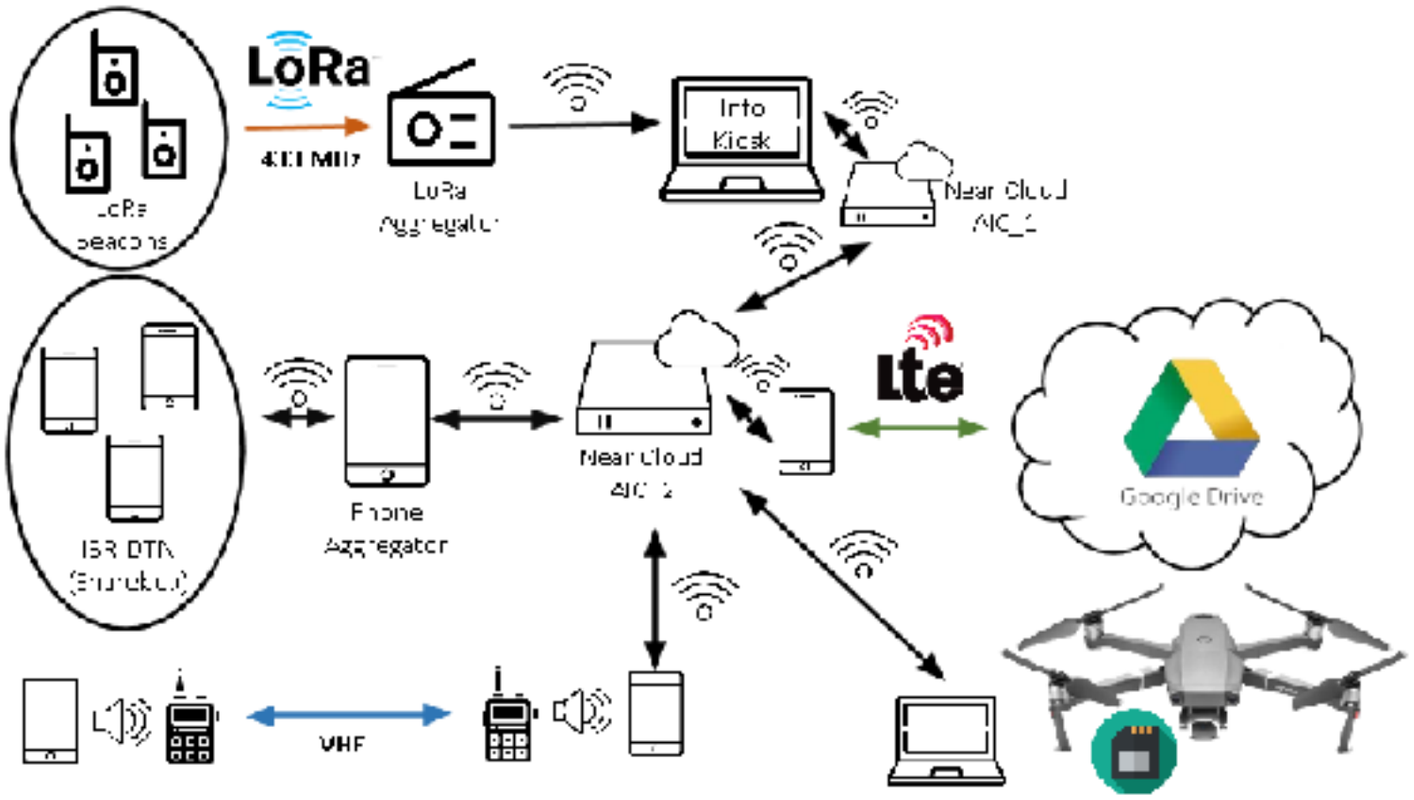
Flood Scenario 2

Flood Scenario 3

Flooding can be visualized based on data sent by responders and by using the cached aerial and flood maps

Estimations can be confirmed or updated by images sent by responders in real- time

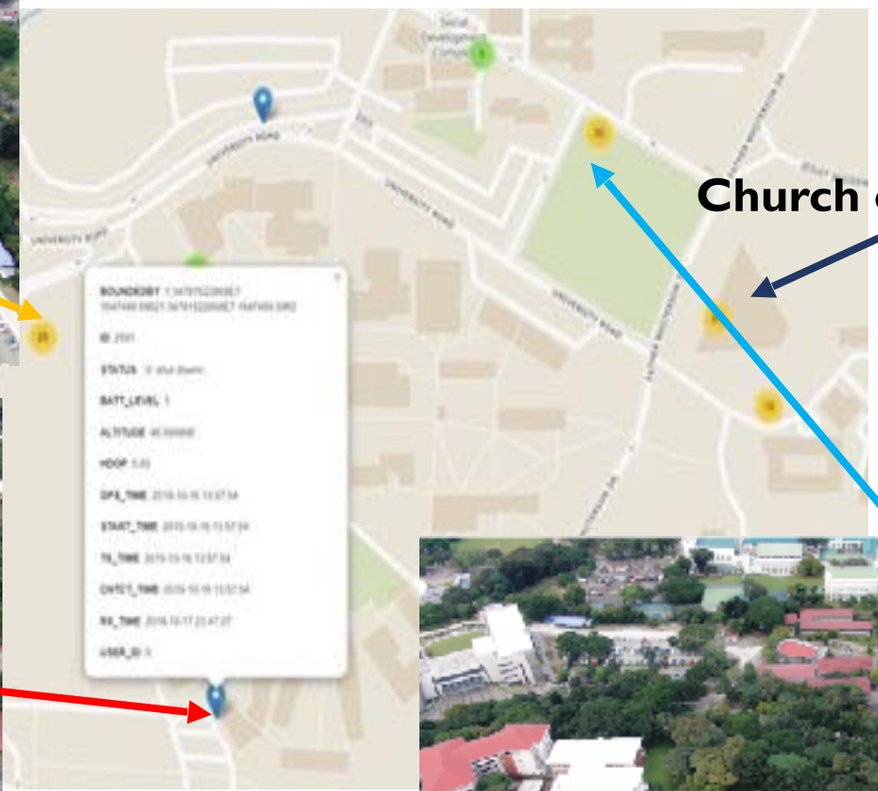
Emergency Drill Deployment



Undergrads, Graduate Students, Research Assistants and Faculty

UAV, LoRa Beacons, and Responder Data Collection
October Disaster Drill 10/16/19 ADMU

Baseball Field



Church of Gesu

Ocampo Field

Bellarmine Field

Screenshots from Videos from Two Drones

Field Responder Data Collection into a Mobile Cloud

Send Beacon Messages + Taking Picture of Damage, Survivors, Injured
UAVs Detect the Beacon Messages and Take Video and Pictures of Campus
Roving Aggregators Collects Data from Responders in Mobile Cloud

LoRa Beacon + Mobile Cloud For First Responders

Beacon Messages Received by UAV

1	2454	2	-59	10/10/2019 13:55	5.00092	121.0798	92.7	1.15	2	1
2	2455	1	-67	00/00/00 00:00:00	0	121.0752	80.4	1.09 ..Still in need of medical assistance	2	1
3	2456	2	-55	15/10/2019 8:55	16	121.0798	92.7	1.15		
4	2457	6	-62	09/01/1980 13:55	0	138.65	56.6	0.92 J. P.20.M.First aid applied to injured people		
5	2458	2	-58	15/10/2019 13.55	13	121.0798	92.7	1.15		
6	2460	6	-58	15/10/2019 13:55	13	121.0798	92.7	1.15		
7	2470	2	-59	15/10/2019 13.55	13	121.0798	92.7	1.15		
8	2471	6	-58	09/01/1980 13:55	0.000007	138.65	56.6	0.92 J. P.20.M.First aid applied to injured people		
9	2472	1	-68	09/01/1980 13.55	0.000007	-138.65	56.6	0.92 J. P.20.M.First aid applied to injured people		
10	2473	2	-50	15/10/2019 8:00	0	121.0798	92.7	1.15		
11	2474	6	-59	09/01/1980 13.55	0.000247	-138.65	56.6	0.92 J. P.20.M.First aid applied to injured people		
12	2475	2	-50	15/10/2019 13:55	44	121.0798	92.7	1.15		
13	2476	6	-68	09/01/1980 13.55	31.00006	-138.65	56.6	0.92 J. P.20.M.First aid applied to injured people		
14	2477	1	-67	15/10/2019 13:55	0	121	80.4	1.09 ..Still in need of medical assistance		
15	2478	2	-58	15/10/2019 8.05	21	121.0798	92.7	1.15		
16	2479	6	-60	09/01/1980 13:55	14.64119	121.079	56.8	0.92 J. P.20.M.First aid applied to injured people		
17	2480	1	-67	15/10/2019 13.55	14.68997	121.0752	0	0.96 ..0..still in need of medical assistance		
18	2481	2	-59	15/10/2019 8:55	16	121.0798	92.7	1.15		
19	2482	1	-71	15/10/2019 13.55	16	121.0798	92.7	1.15		
20	2483	2	-60	15/10/2019 13:55	16	121.0798	92.7	1.15		
21	2484	6	-59	09/01/1980 13.55	14.64119	121.079	56.8	0.92 J. P.20.M.First aid applied to injured people		
22	2485	2	-60	15/10/2019 13:55	14.64009	121.0798	56.63	1		
23	2486	1	-65	15/10/2019 8.05	94	121.0752	0	0 ..0..still in need of medical assistance		
24	2487	2	-59	15/10/2019 13:55	0	121.0798	56.63	1		
25	2488	6	-65	09/01/1980 13.55	23	121.079	56.8	0.92 J. P.20.M.First aid applied to injured people		

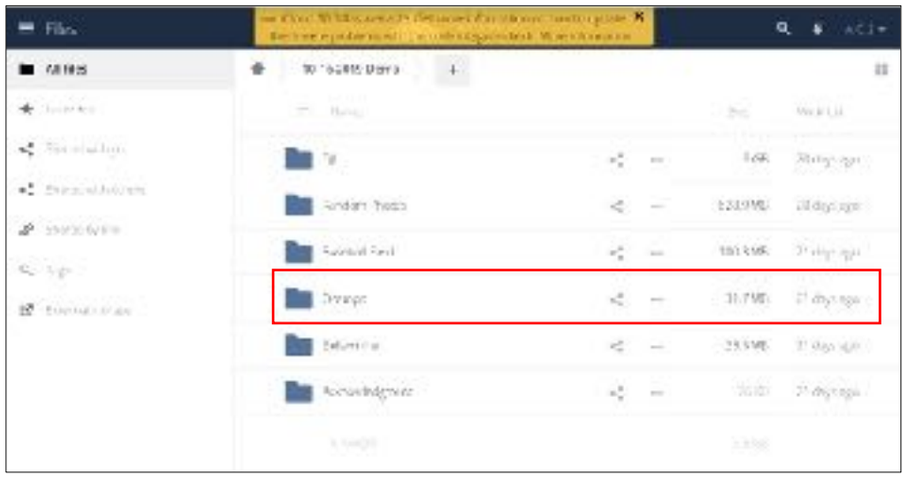
Time, GPS, Signal Strength, Message

Photos from the Responders

Post Deployment Upload to Distant Command Center for DRR Decisions

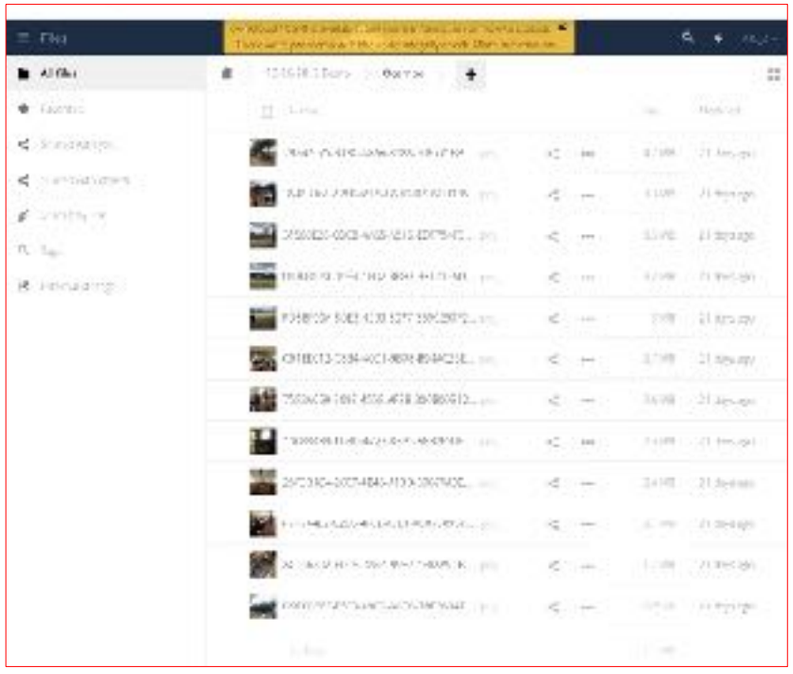
Data Files in Mobile Cloud
100 MB -10 GB

Shared Data to Distant Command Center

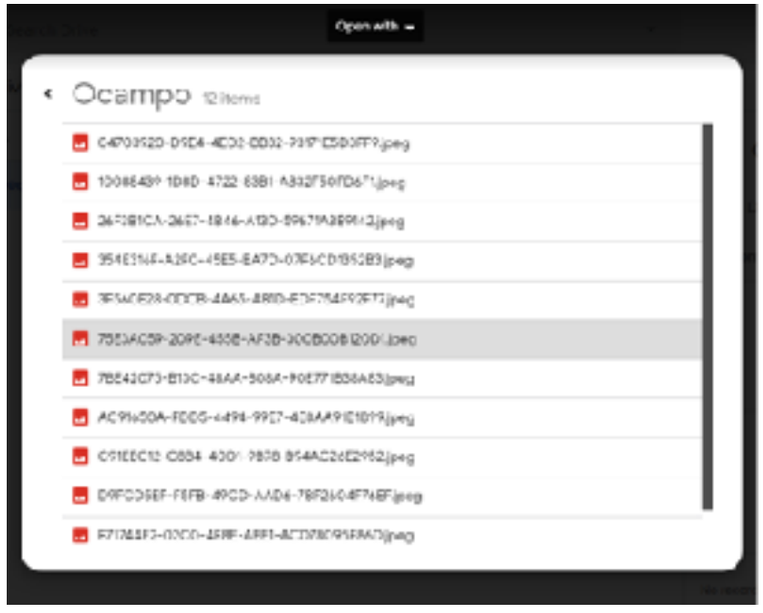


ownCloud folder for Disaster Drill

Google Drive of command center



Content of Ocampo Field Evacuation Site



Content of uploaded zip file (about 30MB of data per site)

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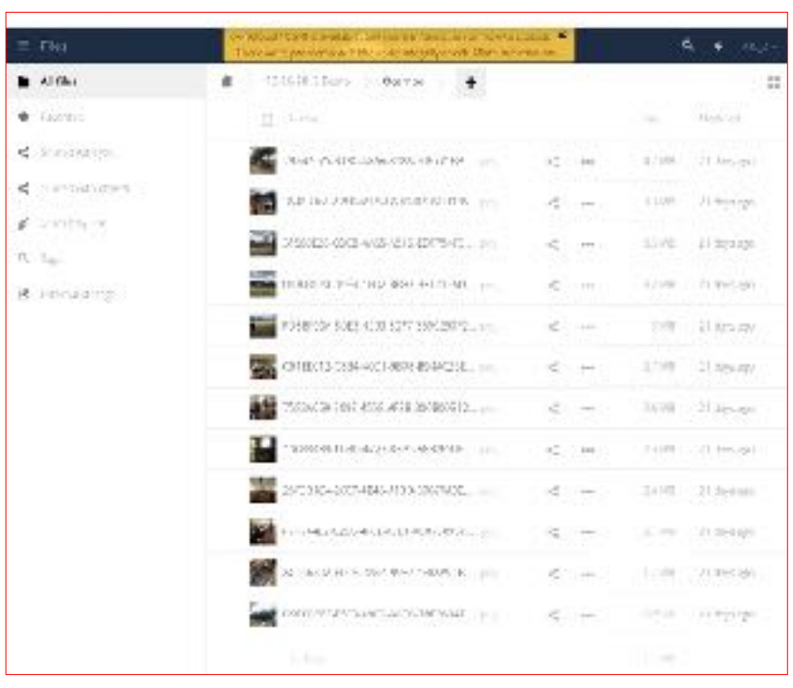
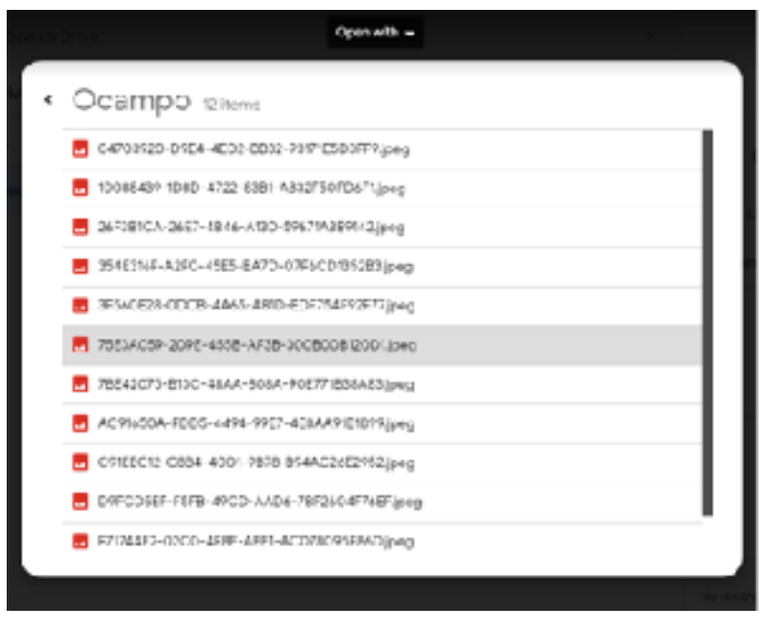
LoRa Beacon & Messaging

Name: Kris
Msg. date: 2019-04-30
Msg. time: 14:57:06
Birthdate: 1995-07-04
Location: 14.6380505°, 121.0764095°, 13.67
Message: All exits are blocked by debris.

Google Drive of command center



Content of Ocampo Field Evacuation Site



Content of uploaded zip file (about 30MB of data per site)

ATENEO DE MANILA UNIVERSITY

Ateneo Innovation Center

Try TeraBytes of Preloaded Content on our Mobile Cloud

Why Mobile Cloud?

- Low Cost
- Terabyte Storage
- Cached Content
- Low Power
- Computing Services

Try It Now!

1. Connect to AIC
   SSID: **AIC_NearCloud**
   Password: **onebigfight**
2. Go to http://192.168.1.1/owncloud
3. Click on the folder and/or file.

Power — Computer — TB Storage — Mobile Cloud — WiFi Devices

Schools

Library

Video

Knowledge Channel

Tutorial

MATH, SCIENCE, AND ENGLISH TUTORING

Courses

Visual Aids

Curriculum

Vehicles

Navigation

V2X Comms

Entertainment

Training Modules

Big Data

Digital Signage

Corporate/LGU

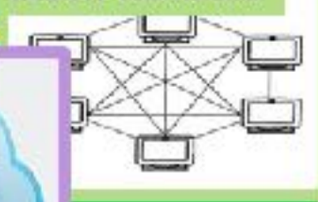
Disaster Response

High-Resolution Maps for Land Use, Flooding, etc.

Computing Services

Safe Storage

Mesh Network



5G

Healthcare

Sensor Network (Agriculture)

Mobile Cloud for V-X

We Want to Deploy Mobile Cloud Devices in Schools and LGU of CCARPH Partners

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Training of Youth Volunteers on Clean Water System, Near Cloud System and Image Transmission Via Radio, 16 Nov 2019

Training and Demonstration of Near Cloud System
Makilala Institute of Science and Technology, 18 Nov 2019

Training and Turn-over of Near Cloud System
Ateneo de Davao University, 19 Nov 2019

International Collaboration in the New V-Hub Standard for V-X Information Systems in Disasters and The Philippine Use Case for Smart Beacons, UAVs, DTN, and Mobile Clouds

Philippine - Japan Cooperation has proved very fruitful - New V-Hub Recommendation based on 'everyday' technology that is prepositioned for disaster operations.

The Philippine Use Case for the New V-Hub for Disaster has advanced and several technologies are being deployed in preparation for actual disasters.

The Philippine Team has contributed several new technologies in actual deployment.

LoRa Beacon Communications for Early Situational Awareness without 3G-4G Assets.
Beacon Hunting with Fixed Wing or Multi-Rotor UAV provides Large Coverage Area
Responders use DTN data sharing protocols demonstrated in this work.
UAV Data Ferries is a viable way of information sharing in Disaster Operations
Emergence of the Mobile Cloud as a Powerful New V-Hub Capability
There is Extensive 'Peacetime' Applications for V-Hub Network, and Mobile Cloud technology.

We gratefully acknowledge the expert help of our colleagues in the Ateneo de Manila University, Toyota InfoTech Center, TTC - Japan, SHARE Project Partners, Internet Society, CCARPH Program, DOST and DICT.

December 4-5, 2019
Quezon City, Philippines

Philippines-Japan
Workshop on Wireless ,Radio and Antenna Technologies (PJWWRAT)